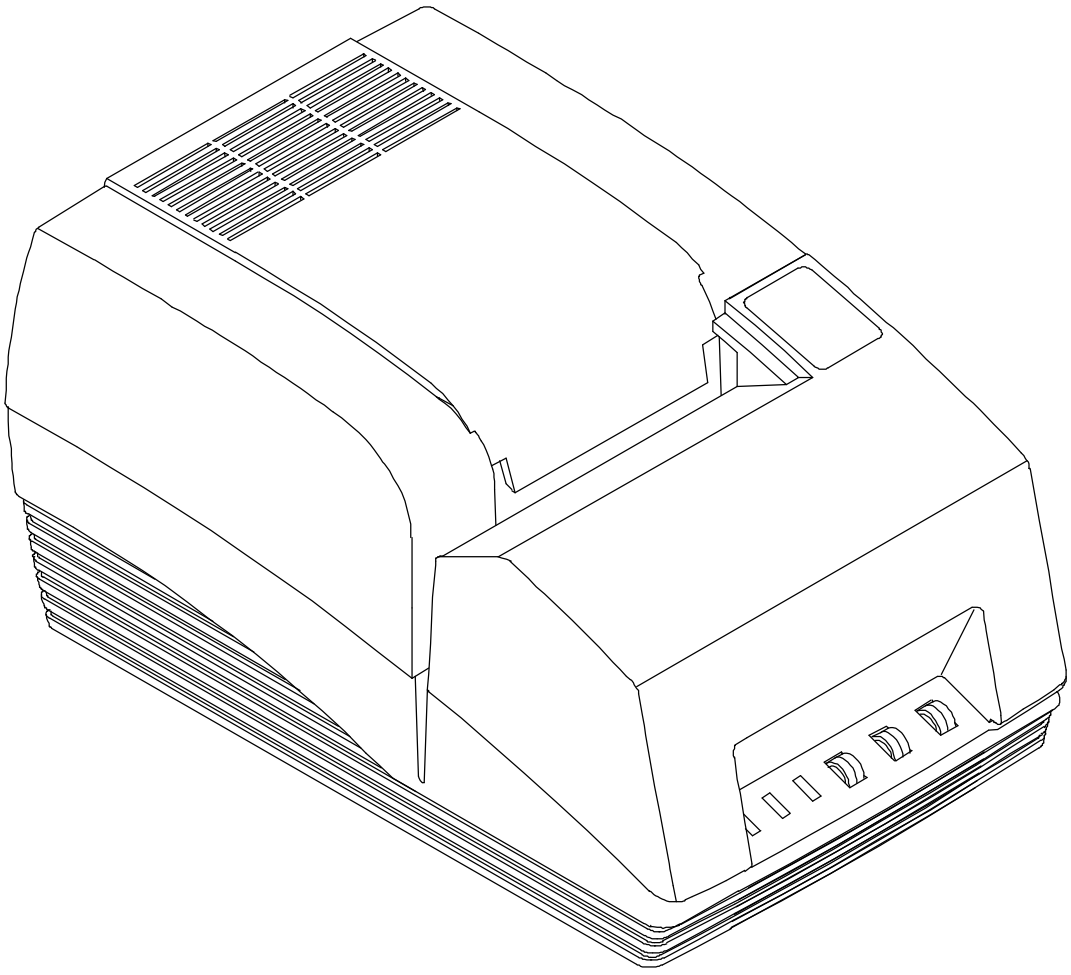
PcOS SERIES 150 **Receipt/Validation/Journal Printers**

PROGRAMMER'S GUIDE

Rev F



Ithaca Peripherals

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Change History

Rev. F
Removed redundant codes on page 82
Added Option 1: Epson emulation on page 90
Added Line Feed Before Cut to page 92
Added SSD Signal to page 96
Added Epson/Axiohm and STAR cash drawer connectors on page 118
Changed Code 3 of 9 to Code 39

Rev. E
Reformatted entire document
Corrected miscellaneous spelling and grammar mistakes
Changed RS1284 to IEEE 1284

Rev. D Update for Firmware Rev 1.20
Added NCR2567 emulation commands

Rev. C Update
Added section on parallel-port PnP
Added information about the web site
Added section on star emulation
Removed all references to the cover (The M150 Printer does not have a switch on the cover.)
Added trademarks for OKIDATA and STAR
Added Code 93 to bar code section
Added bar code justification commands

Rev. B Update
Corrected physical specifications
Corrected warranty information

Rev. A Initial Release

Disclaimer

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Federal Communications Commission Radio Frequency Interference Statement

This equipment complies with the limits for a Class A computing device in accordance with the specifications in Part 15 of FCC rules which are designed to minimize radio frequency interference during installation; however, there is no guarantee that radio or television interference will not occur in any particular installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on while the radio or television is on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the radio or television receiving antenna.
- Relocate the printer with respect to the receiver.
- Plug the printer and receiver into different outlets.

The user may need to consult their dealer or an experienced radio/television technician for additional suggestions. The user may find the following booklet prepared by the Federal Communications Commission helpful: *How to Identify and Resolve Radio/TV Interference Problems.*

The booklet is available from the United States Government Printing Office, Washington, DC 20402. Ask for stock number 004-000-00345-4.

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Chapter 1:
Overview of the Series 150 Printer

Warranty Information

Warranty Options

All PcOS Series 150 Printers come with a standard 24-month warranty covering both parts and labor. An optional warranty, covering both parts and labor for an additional 12 months, may be purchased separately. For more information concerning the warranty options, please contact your dealer or the Sales Department at Ithaca Peripherals.

Ithaca Peripherals
20 Bomax Drive
Ithaca, NY 14850

(607) 257-8901

Service Information

The printer may be serviced by a dealer, an independent service contractor, or by Ithaca Peripherals. If the printer is to be serviced by Ithaca Peripherals, a return authorization is required. Call Field Engineering at (607) 257-8901, and ask for a return authorization.

The printer will need to be packed in the original packing material and box and sent to Ithaca Peripherals. Information on how to ship the printer will be provided with the return authorization.

What is in this book?

Who should read this book?

This book is intended for system engineers or system integrators. It contains the information needed to integrate the Series 150 Printer with a point-of-sale terminal and to program the terminal to communicate with the printer.

What does it cover?

This programmer's guide provides the following information.

- Start-up information including diagnostics and fault conditions
- Command descriptions
- Character fonts
- Printer features
- Parallel and RS-232 interface information
- Communications and buffers
- Command code reference tables

Where can you find more information?

An Operator's Guide is available that describes setup and use of the Series 150 Printer. It describes basic procedures such as changing paper; printing on a form; and replacing the ribbon cassette. A Maintenance Manual is also available; however, it is intended for trained, service technicians.

For information about ordering these books or programs, refer to the next section or download them from the Internet.

In addition, there are a number of drivers available that will support various environments.

Windows 95 print driver with documentation	Part No. 100-9167
Windows NT 4.0 print driver with documentation	Part No. 100-9170
OPOS drivers with documentation	Part No. 100-9732
Master character set definitions	Part No. 100-9785

Contacting Ithaca Peripherals

The Sales and Field Engineering Departments will be able to help you with most of your questions.

Contact the Sales Department to receive technical support, order documentation, receive additional information about the Series 150 Printer, order supplies, or obtain information about other products by Ithaca Peripherals.

Contact the Field Engineering Department if you would like information about your warranty or if you need to send a printer in for service.

You can reach both the Sales and Field Engineering Departments at the following address and phone or fax numbers.

Ithaca Peripherals
20 Bomax Drive
Ithaca, NY 14850

Main phone	(607) 257-8901
Main fax	(607) 257-8922
Sales/Field Engineering fax	(607) 257-3868

Internet Support

Ithaca Peripherals maintains an Internet website. The address is http://www.ithper.com. On the technical support page, you will find support information on all of our printers. The Model 150 support pages offer the latest information. They include the current version of this manual, program examples, test procedures, programming instructions, and all the supported print drivers.

Chapter 2:
General Description

Series 150 Models

There are four basic models of the Series 150 Printer. They are:

MODEL 151 RECEIPT PRINTER
MODEL 152 RECEIPT/JOURNAL PRINTER
MODEL 153 RECEIPT/JOURNAL/VALIDATION PRINTER
MODEL 154 RECEIPT/VALIDATION PRINTER

Standard Features

The following features are common to the entire family of printers:

- 340 cps logic-seeking print speed
- 4.0 inches per second paper-feed speed
- 2.40-inch (normal) or 2.83-inch (wide) print zones
- Snap on ribbon cassette
- Dual cash drawer drivers with status
- Centronics parallel, IEEE 1284 or serial RS232C interface
- Configurable receive buffer
- Standard, EPSON, MICROLINE, STAR, and NCR2567 emulations [1]
- Standard APA or EPOS bit-image graphics
- Standard and EPOS International Character Sets
- 8, 10, 12, 15, 17.1, 20, and 24 characters per inch selections
- Emphasized, enhanced, double-wide, double-high, double-wide double-high, half-high, underline, subscript, superscript, and rotated print
- Operator-visible print zone
- Self-diagnostics
- Setup and configuration utility program
- Operator's manual

[1] Other emulation's can be made available. Contact Ithaca Peripherals' Sales Department for more information.

Receipt Printer

The Model 151 receipt printer only provides receipt functions. The last line printed on the receipt is within one inch of the tear-off or cut-off edge of the receipt. The receipt printing appears right-side up with the total at the bottom as the receipt appears from the top of the printer and is presented to the operator.

The receipt printer handles one-, two-, or three-ply paper. The optional cutter is able to cut one- and two-ply paper.

This printer does not have the ability to validate. Commands that operate validation modes on other Series 150 Printers will not function.

Receipt/Journal Printer

The Model 152 receipt/journal printer adds the journal feature to the Model 151 receipt printer. The journal take-up is able to rewind the second copy of the 3.5-inch diameter 2-ply paper roll (125 feet).

The receipt/journal printer does not have the ability to validate. Commands that operate validation modes on other Series 150 Printers will not function.

Receipt/Journal/Validation Printer

The Model 153 receipt/journal/validation printer adds a validation capability to the Model 152. The validation will accommodate up to 16 lines at 8.0 lines per inch (lpi) or 12 lines at 6.0 lpi.

The form is inserted from the front and extends out the left side and/or top of the printer. It rests on a fixed form stop. The validation movement is controlled from the movement of the receipt and journal.

Receipt/Validation Printer

The Model 154 receipt/validation printer adds validation, as described above, to the Model 151. This is a Model 153 without journal take-up.

Chapter 3:
General Specifications

Printing Specifications

Printing method	impact dot matrix
Head wire arrangement	9 pins in line
Print wire diameter	0.34 mm (0.012 inch)
Print wire pitch	0.353 mm (0.013 inch)
Printing directions	bidirectional, logic-seeking
Print zone	60.96 mm (2.40 inch) or 71.97 mm (2.83 inch)
Characters per inch	Refer to Table 1.
Characters per line	Refer to Table 1.
Characters per second	Refer to Table 1.

Print Pitch Capability (in characters per inch)	Normal 2.40" Maximum Characters per Line	Characters per Second
8	18	220
10	24	275
12	28	330
15	36	340
17.1 (condensed)	41	340
20 (super-condensed)	48	340
24 (super-condensed)	57	340
5 (double-wide)	12	175
6 (double-wide)	14	175
7.5 (condensed, double-wide)	18	175
8.5 (condensed, double-wide)	20	175
10 (super-condensed, double-wide)	24	175
12 (super-condensed, double-wide)	28	175

Table 1 Normal print zone character specifications

Note: The M150 Compatibility Mode can be set in menu RAM and will limit printing to 40 characters in 17.1 characters per inch (cpi).

Print Pitch Capability (in characters per inch)	Wide 2.83" Maximum Characters per Line	Characters per Second
8	22	(180)
10	28	(250)
12	34	(275)
15	42	(275)
17.1 (condensed)	48	(275)
20 (super-condensed)	56	(275)
24 (super-condensed)	68	(275)
5 (double-wide)	14	(140)
6 (double-wide)	17	(140)
7.5 (condensed, double-wide)	21	(140)
8.5 (condensed, double-wide)	24	(140)
10 (super-condensed, double-wide)	28	(140)
12 (super-condensed, double-wide)	34	(140)

Table 2 Wide print zone character specifications

Character Generation

All the character sets and modes are based on one of two character cells, 10 wide by 9 high or 12 wide by 9 high. Double-wide mode is twice the width of normal mode, 20 wide by 9 high or 24 wide by 9 high.

In utility print mode, the character cell consists of five full dots and five half dots horizontally by nine full dots vertically. The character is a 9 by 9 character. In high speed draft (HSD) mode, the character cell is shortened by one-half and one full dot column yielding a 7 by 9 character.

Each character is justified to the left of the cell. The first four columns of the full dots and the first three columns of half dots are used to generate the character in high speed draft. In utility mode, the first five columns of the full dots and the first four columns of the half dots are used. The last full dot and the last two half dots are used for character spacing in both modes.

The following illustration shows a single-wide character cell.

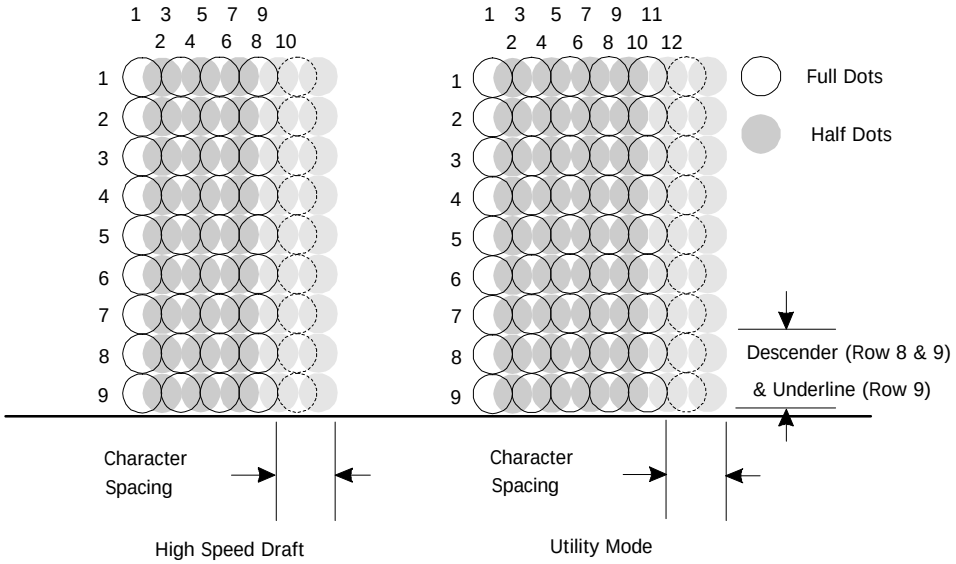


Figure 1 Single-wide character

The example above, which only holds true for the 12 cpi mode, shows the full dots as adjacent to each other in the character cell. The 10 cpi mode allows a gap between adjacent full rows; 17 and 24 cpi allow an overlap of full rows. The printer cannot print adjacent full and half dots in any single row. Some graphics (double-density, half-speed) allow adjacent rows to be printed by slowing the print speed by half. Slowing the print speed allows the time between half and full columns to be the same as the time between full columns in full-speed operation.

The following illustration shows the use of full and half dots as well as descenders to form characters.

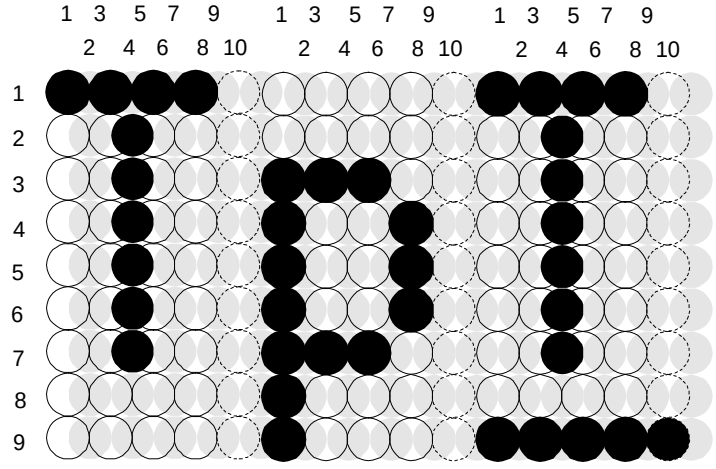


Figure 2 Character forming

Physical Specifications

Dimensions

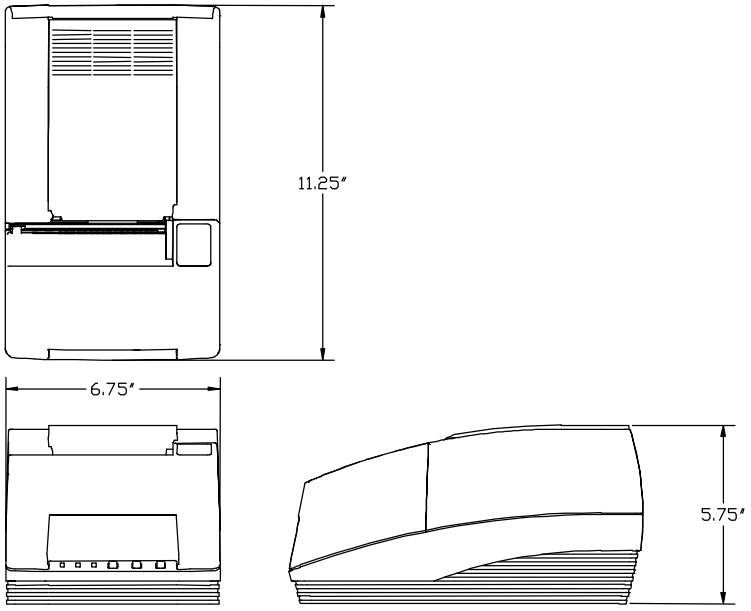


Figure 3 Physical dimensions

Weight

Approximate weight	6.5 pounds
Shipping weight	9.5 pounds

Electrical Characteristics

Self-powered AC

The Model 150 is designed to be AC self-powered in domestic and international markets. The printer is equipped with a universal input power supply that is designed to operate worldwide without modification.

Supply Voltage Rating (VAC)	Supply Voltage Range (VAC)	Frequency (Hz)	Rated Power (watts)	Idle Current (amps)	Printing Current (amps)
100 - 240	90 - 264	47 - 63	45	0.08 @ 120VAC 0.04 @ 240VAC	0.9 @ 120VAC 0.4 @ 240VAC

Table 3 Power input requirements

Interface Specifications

Serial

The serial interface is a standard RS232 interface on a 9-pin D-shell connector. It is defined as a standard DTE device. A null modem cable is required to interface the printer to another DTE device (i.e. a personal computer). See the serial port description later in this manual for more information.

Parallel

The parallel port is a standard 25-pin D-shell as defined in the IEEE 1284-A standard. See the parallel port description later in this manual for more information.

Cash Drawer

The M150 Printer supports dual cash drawers with status. The interface will provide status and 24 VDC at up to 1.5 amps to the cash drawer. See the cash drawer interface description later in this manual.

Media Specifications

Ribbon

Inking method	Cartridge type, 1.8 m seamless ribbon with reinker
Ink color	Black or purple
Ribbon life at 25 °C	3 million (black) or 4.5 million (purple) characters to ink depletion[2]
Manufacturer	Only Ithaca Peripherals approved ribbons should be used.

Receipt Paper

Paper-feed method	Friction feed
Paper-feed pitch	Default - 1/8 inch; can be set in units of 1/216 inch by software command
Paper width	2.75, 3.0, or 3.25 inches
Roll diameter	3.5 inches
Paper thickness	0.003 - 0.0035 inch at 25 °C
Roll paper core	Inside diameter 7/16 inch or more
Roll footage	240 feet (typical)
Receipt-paper out	Paper exhaust is sensed by software, and printing is prevented at the end of the roll.

[2] The ribbon must be from an approved manufacturer and tested with a rolling ASCII test pattern using 15 cpi in HSD.

Receipt/Journal Paper

Paper-feed method	Friction feed
Paper-feed pitch	Default - 1/8 inch; can be set in units of 1/216 inch by software command
Paper width	2.75, 3.0, or 3.25 inches
Roll diameter	3.5 inches
Paper thickness	0.006 to 0.007 inch two-ply at 25 °C 0.009 to 0.0105 inch three-ply at 25 °C
Roll paper core	Inside diameter 7/16 inch
Roll footage	110 feet - two-ply (typical) 70 feet - three-ply (typical)
Receipt-paper out	Paper exhaust is sensed by software, and printing is prevented at the end of the roll.

Printable Area

Receipt Printing

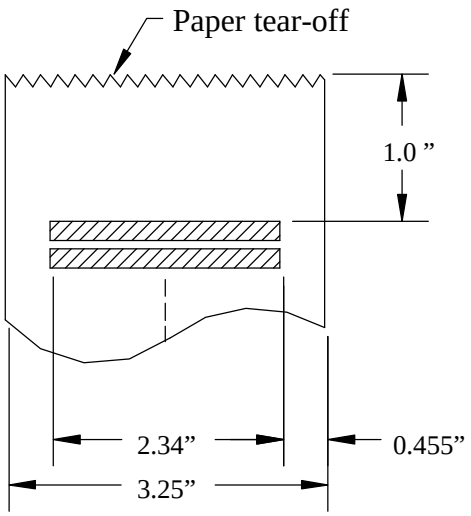


Figure 4 Receipt printable area

Receipt Printing with the Autocutter

The paper is cut one inch from the last line of print. This minimizes the wasted paper required when the paper must be moved to the cut-off position.

Validation Forms Printing

Lines per inch (lpi)	Lines
8	16
6	12

Table 4 Validation lines

Validation - Top Insertion

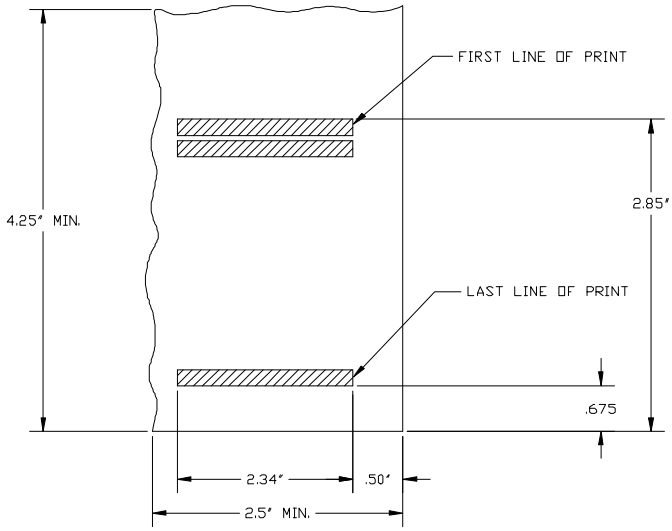


Figure 5 Validation print – top insertion

Validation - Left-side Insertion

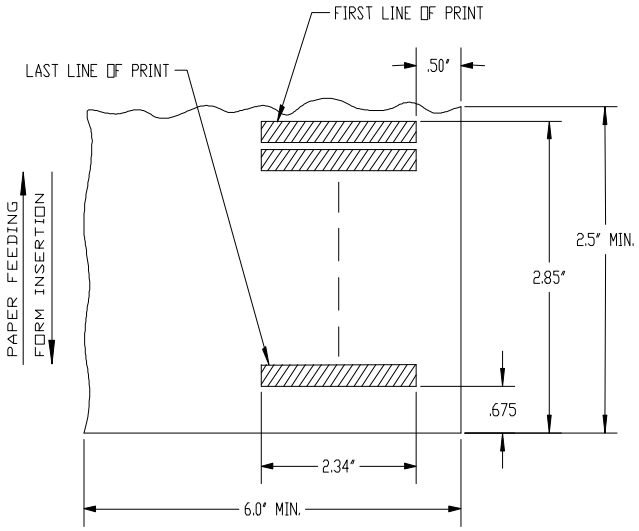


Figure 6 Validation print – left-side insertion

Validation Forms Insertion

Form insertion is from the top or the left side of the printer. Automatic form location is under software or firmware control. Character rotation under software control will allow check validation to appear right-side up when the check is removed.

Chapter 4:
Control Codes Overview

This programmer's guide is designed to help users of the PcOS Series 150 Printer develop applications. The Series 150 Printer is a point-of-sale (POS) printer that has several features not normally found on general purpose printers. Because of these special features, the Series 150 Printer has distinct control codes. This manual documents all of the control codes with an emphasis on those codes that are unique to the Series 150 Printer.

All PcOS Series 150 Printers have either a serial or parallel interface. Both interfaces provide the same printer control[3] and use the same codes.

Nomenclature

When describing control codes, there is often confusion as to whether the description is decimal, hex, or ASCII. To minimize the confusion, this manual will use the following nomenclature when describing control code sequences.

[ ] This encloses a control character. This is a single, 8-bit value as defined in the standard ASCII tables. An example would be [ESC], which would represent a 1BH or 26 decimal.

< > This encloses an 8-bit value in decimal format. This value will be from 0 to 255. An example would be <2> which would represent 02H or 2 decimal.

<n> This indicates a variable parameter. n can have a value of from 0 to 255. The meaning of n is described and defined in the description of the command.

$<n_1>$ $<n_2>$ This indicates that there are two parameters, n_1 and n_2 where both can have values from 0 to 255.

$<m_1>$ $<m_2>$ This an IPCL parameter consisting of two digits where m_1 and m_2 are ASCII characters from 0 to 9. The values will be combined to form a value from 0 to 99. If m_3 is included, the parameter will be combined to form a value from 0 to 999.

If two values are specified, there must be two bytes added to the IPCL code. That is if the command specifies $<m_1>$ $<m_2>$ and the desired value is 5, the value must be specified as 05.

x All other characters in control strings represent ASCII characters. For example, [ESC] 1 would represent 1BH followed by 31H.

The CFG150 configuration and demonstration program[4] uses the same nomenclature. All print examples shown in this manual are available for CFG150.

---

[3] The serial and IEEE 1284 interfaces provide a few additional interface capabilities over the standard parallel interface. Both serial and IEEE 1284 interfaces provide a bidirectional data path.

[4] CFG150 is available from Ithaca Peripherals at no cost. This program runs on IBM PC's and compatibles.

In many cases, applications require that control sequences be specified in hex or decimal codes. In most cases, commands are specified in ASCII, hex, and decimal. The chart in Appendix A lists ASCII, decimal, and hex equivalents.

Standard Emulation

The standard control codes for the Series 150 Printer are extensions and subsets of the IBM emulation provided on other PcOS products. In all cases, an application designed for a Series 50 Printer with IBM code sets will function with a Series 150 printer. There are, however, more features in the Series 150 Printer that can be used for new applications.

EPOS Emulation

ESC/POS[5] is referred to here as EPOS. The Series 150 Printer supports an EPOS emulation with extensions. The emulation is designed to allow the Series 150 Printer to be used with applications that are designed for Seiko Epson printers. It is intended that the standard emulation be used for new applications. Not all of the features of Series 150 Printers are supported by EPOS.

This manual will include the EPOS code equivalent for features of the Series 150 Printer that are supported by EPOS. When EPOS commands are significantly different from the standard emulation, an independent EPOS description is provided.

MICROLINE Emulation

The standard control codes for the Series 150 Printer are extensions and subsets of the MICROLINE emulation provided on other PcOS products. In all cases, an application designed for a Series 50 Printer with MICROLINE code sets will function with a Series 150 Printer. There are, however, more features in the Series 150 Printer that can be used for new applications.

STAR Emulation

The standard control codes for the Series 150 Printer are extensions and subsets of the STAR emulation provided on other PcOS products. In all cases, an application designed for a Series 50 Printer with STAR code sets will function with a Series 150 Printer. There are, however, more features in the Series 150 Printer that can be used for new applications.

NCR2567 Emulation

The standard control codes for the Series 150 Printer are extensions and subsets of the NCR2567 emulation provided on other PcOS products. In all cases, an application designed for a Series 50 Printer with NCR2567 code sets will function with a Series 150 Printer. There are, however, more features in the Series 150 Printer that can be used for new applications.

IPCL Codes

IPCL (Ithaca Printer Control Language) codes are designed to control a printer without using control characters, i.e., characters less than 20H. Only the standard emulation supports IPCL. Not all commands are supported by IPCL codes. For those commands that are, the IPCL code is listed.

[5] ESC/POS is a registered trademark of the Seiko Epson Corporation.

In rare cases, an IPCL code will interfere with the text that is to be printed. The IPCL translator can be disabled with an [ESC]y<4> command.

Application Development

To aid in application development, there are several sections in this manual that are designed to help the programmer understand the Series 150 Printer. The first is a detailed description of each of the commands. The second section is an explanation of how the printer works. It explains the internal print buffer, the communications link, and how the host computer and printer interact. The third is a description on how to use the CFG150 program to help develop applications.

Tables and Charts

Throughout this guide, there are charts and tables that list commands and features. In most cases, these charts cross reference the page that describes the command. Commands are grouped by function and can at times be hard to find. To minimize the time it takes to find commands, there are two code summary charts in the following section, one ordered by code and one by function.

Chaper 5:
Printer Control Codes

Print/Paper Motion

Low-level Paper Motion Control

Function	**Carriage return**
ASCII	[CR]
Hexadecimal	0DH
Decimal	<13>
IPCL	&%CR
EPOS	0DH
Description	This command prints the contents of the print buffer (if any) and resets the next character print position to the left margin. A line feed is not performed unless auto-feed was active. The left margin is defined by the current print station, the print rotation direction, and the left margin command. **Note:** In single-line mode, the [CR] is used to terminate all lines. The printer will go busy[6] after the [CR] is received. The printer will not be ready to accept data again until the previous data is printed.

Function	**Line feed**
ASCII	[LF]
Hexadecimal	0AH
Decimal	<10>
IPCL	&%LF
EPOS	0AH
Description	This command prints the contents of the buffer (if any) and advances the paper one line at the current default line spacing. The next character print position is not reset to the left margin unless auto-CR is active.

[6] In one-line mode, the parallel port busy signal will occur as a result of receiving the [CR].

In serial mode, the busy indication will be delayed until the [CR] is processed by the input software. Data sent to the printer after the [CR] will not be lost unless the printer is power cycled.

Horizontal Motion Control

There are several commands that can control the horizontal position of characters. Many applications use space control to position fields. However, there is the ability to control character position with horizontal tab stops. This is done by using the horizontal tab [HT] to move to those tab stops.

Function	**Horizontal tab**
ASCII	[HT]
Hexadecimal	09H
Decimal	<9>
IPCL	&%HT
EPOS	[HT]
Description	This command inserts spaces in the print buffer up to the next tab stop. The default tab locations are every 8 spaces.

Function	**Back space**
ASCII	[BS]
Hexadecimal	08H
Decimal	<8>
IPCL	&%BS
EPOS	[BS]
Description	This command prints the data in the print buffer and shifts the current horizontal position by one character width to the left. If the current position is at the left margin, the [BS] is ignored.

Function	**Set horizontal tab stops**
ASCII	[ESC] D $<n_1>$ $<n_2>$ $<n_3>$ ... $<n_i>$ 0
Hexadecimal	1BH 44H $<n_1>$ $<n_2>$ $<n_3>$ ... $<n_i>$ 00H
Decimal	<27><68>$<n_1>$ $<n_2>$ $<n_3>$ ... $<n_i>$ <0>
IPCL	none
EPOS	[ESC] D$<n_1>$ $<n_2>$ $<n_3>$ ... $<n_i>$ 0
Description	This command sets tab stops at the character columns specified by <n>. The end of the setting is specified by a <0>. All previously set tabs will be cleared by this command. There is no restore-defaults procedure other than to respecify the tabs. The power up default is every 8 spaces, i.e., 9, 17, 25, and so on. Column sizes are in accordance with the current character pitch. Setting tabs that are beyond the station width is possible. A [CR] will be inserted if the tab is used. Printing will begin at the home position.

Function	**Reset horizontal and vertical tab stops**
ASCII	[ESC] R
Hexadecimal	1BH 52H
Decimal	<27><82>
IPCL	&%HV
EPOS	none
Description	This command resets horizontal and vertical tab stops to power up configuration. The power up horizontal default is every 8 spaces, i.e., 9, 17, 25, and so on. The vertical default is every line.

Function	**Set justification**
ASCII	[ESC] a <n>
Hexadecimal	1BH 61H <n>
Decimal	<27><97><n>
IPCL	&%JL, &%JC, &%JR
EPOS	[ESC] a <n>
Description	This command sets the horizontal justification.

Where <n>	0 = left justified	&%JL
	1 = center justified	&%JC
	2 = right justified	&%JR

The print format can be right, center, or left justified. The value of <n> specifies the justification.

The power on default is left justified.

Note: Lines that have mixed size characters cannot be centered. For example, a line with mixed single- and double-high cannot be centered. If a line of print is to be double-high and centered, the change to single-high must be done after the line terminator for the double-high line.

Example: [ESC]W<3>Centered[ESC]W<0>[CR] will not print correctly because the printer assumes that more data will follow the [ESC]W<0>. This should be [ESC]W<3>Centered[CR] [ESC]W<0>.

Note: Several line graphic characters stress the printer. If the printer is to print a very dark area, it will do it in steps. The stepping operation only works in left justified mode. In general, this will not cause a problem because the printer will print several black blocks in a row before the stepping program is activated. Auto center and line graphics should be avoided because of character alignment.

Note: Justify commands do not effect graphics.

Vertical Motion Control

Function	**Fine line feed**
ASCII	[ESC] J <n>
Hexadecimal	1BH 4AH <n>
Decimal	<27> <74><n>
IPCL	&%FM <m_1> <m_2> <m_3>
EPOS	[ESC] J <n>
Description	This command prints the contents of the buffer (if any) and performs a line feed of n/216 inch. This command does not change the default line spacing value. The next character print position is reset to the left margin. **EPOS Note:** In EPOS mode, this command performs line feeds in n/144 inch increments.

```
Example of Fine Line Feed

This line is 1/4" below the first.
This line is spaced at the default of 1/8".
```

Figure 7 Example of fine line feed

```
Example of Fine Line Feed[CR]
[ESC]J<54>
This line is 1/4" below the first.[CR][LF]
This line is spaced at the default of
1/8".[CR][LF]
```

Figure 8 Data sent to printer for fine line feed

Function	**Set variable line space n/216 inch**
ASCII	[ESC] 3 <n>
Hexadecimal	1BH 33H <n>
Decimal	<27><51><n>
IPCL	&%SV <m_1> <m_2><m_3>
EPOS	[ESC] 3 <n>
Description	This command sets the default line spacing to n/216 inch. Set n = 1 to 255. This command takes effect immediately and sets the line feed spacing used by [LF] to values other than 1/8 or 7/72 inch. **EPOS Note:** Line spacing of n/144 is used.

Function	**Set line space 27/216 inch**
ASCII	[ESC] 0
Hexadecimal	1BH 30H
Decimal	<27><48>
IPCL	&%ST
EPOS	[ESC] 2
Description	This command sets the text default line spacing to 1/8 or 27/216 inch which is the standard eight lines per inch line spacing at initial power up. **EPOS Note:** In EPOS mode, this command sets 1/6 inch spacing or 6 lines per inch.

Function	**Set line space 21/216 or 7/72 inch**
ASCII	[ESC] 1
Hexadecimal	1BH 31H
Decimal	<27><49>
IPCL	&%SG
EPOS	none
Description	This command sets the default line spacing to 21/216 inch. This line spacing is for APA graphics printing.

Function	**Set variable line space n/72 inch**
ASCII	[ESC] A <n>
Hexadecimal	1BH 41H <n>
Decimal	<27><65><n>
IPCL	none
EPOS	none
Description	This command sets default line spacing to n/72. Set n = 1 to 85. This line spacing does not take effect until enabled by the [ESC] 2 command. This command is provided to maintain backward compatibility with the Series 50, OKIDATA, IBM, and other printers. It can also be used to print on preprinted forms.

Function	**Enable [ESC] A <n> line spacing**
ASCII	[ESC] 2
Hexadecimal	1BH 32H
Decimal	<27><50>
IPCL	none
EPOS	none
Description	[ESC] 2 enables [ESC] A <n> line spacing. This is a companion to the [ESC] A <n> command and puts the specified line spacing into effect. It will remain in effect until another line spacing command is issued.

Function	**Feed <n> lines at current spacing**
ASCII	[ESC] d <n>
Hexadecimal	1BH 64H <n>
Decimal	<27><100> <n>
IPCL	&%FL <m_1> <m_2>
EPOS	[ESC] d
Description	This command prints the contents of the buffer (if any) and performs <n> line feeds at the current line spacing. This command does not change the default line spacing value. The next character print position is reset to the left margin. **Note**: The IPCL command will print from 00 to 99 lines. For example, if you wish to feed 12 lines, the IPCL command would be &%FD12.

Function	**Vertical tab**
ASCII	[VT]
Hexadecimal	0BH
Decimal	<11>
IPCL	&%VT
EPOS	(VT)
Description	The printer sets a line counter to the top of the form whenever a station is selected. By setting vertical tab stops, various form positions can be reached with a [VT] operation.

Function	**Set vertical tab stops**
ASCII	[ESC] B <n_1> <n_2> <n_3> ... <n_i> 0
Hexadecimal	1BH 42H <n_1> <n_2> <n_3> ... <n_i> 00H
Decimal	<27><66><n_1> <n_2> <n_3> ... <n_i> <0>
IPCL	none
EPOS	[ESC] B <n_1> <n_2> <n_3> ... <n_i> 0
Description	This command sets tab stops at line positions specified by <n>. The end of the setting is specified by a <0>. All previously set tabs will be cleared by this command. There can be a total of 64 tab stops specified by this command. The power on default is a tab stop at 1-inch intervals.

Function	**Reset horizontal and vertical tab stops**
ASCII	[ESC] R
Hexadecimal	1BH 52H
Decimal	<27><82>
IPCL	&%HV
EPOS	none
Description	This command resets horizontal and vertical tab stops to power up configuration. The power up horizontal default is every eight spaces, i.e., 9, 17, 25, and so on. The vertical default is every line.

Function	**Form feed**
ASCII	[FF]
Hexadecimal	0CH
Decimal	<12>
IPCL	&%FF
EPOS	none
Description	This command performs a form feed to the top of the form.

Function	**Set top of form**
ASCII	[ESC] 4
Hexadecimal	1BH, 34H
Decimal	<27> <52>
IPCL	&%TF
EPOS	[ESC]L
Description	This command sets the top of form to the current position.

Function	**Set form length in lines**
ASCII	[ESC] C <n>
Hexadecimal	1BH, 43H <n>
Decimal	<27> <67> <n>
IPCL	&%SL<m_1> <m_2>
EPOS	[ESC]C<n>
Description	This command sets the form length to <n> lines at the current line spacing.

Function	**Set form length in inches**
ASCII	[ESC] C [NUL] <n>
Hexadecimal	1BH, 43H <0> <n>
Decimal	<27> <67> <0> <n>
IPCL	&%SI <m_1> <m_2>
EPOS	none
Description	This command sets the form length to <n> inches.

Function	**Begin auto line feed**
ASCII	[ESC] 5 <01>
Hexadecimal	1BH 35H 01h
Decimal	<27><53><01>
IPCL	&%MA
EPOS	none
Description	This command sets auto line feed mode. **Note:** This overrides the configuration setting.

Function	**End auto line feed**
ASCII	[ESC] 5 <0>
Hexadecimal	1BH 35H 00H
Decimal	<27><53><0>
IPCL	&%CA
EPOS	none
Description	This command ends auto line feed mode. **Note:** This overrides the configuration setting.

Function	**Reverse line feed**
ASCII	[ESC]]
Hexadecimal	1BH 5DH
Decimal	<27><93>
IPCL	&%LR
EPOS	none
Description	This command performs a reverse line feed at the current line spacing. **Note:** The receipt station can tolerate no more than 1/2 inch of reverse feed. **Note:** This command is not available in models with validation.

Character Font

Function	**Begin High Speed Draft (HSD) Mode**
ASCII	[ESC] # <0>
Hexadecimal	1BH 23H 00H
Decimal	<27><35><0>
IPCL	&%QT
EPOS	[ESC] ! <n>
Description	This command begins high speed draft print mode (1 pass, 7 x 7 font). Enhanced, emphasized, subscript, superscript, and underline character attributes are not available in this mode. To maintain optimum print speed, the printer should be returned to HSD mode when enhanced print is not required.

Function	**Select print quality mode**
ASCII	[ESC] I <n>
Hexadecimal	1BH 49H 00H
Decimal	<27><73><0>
IPCL	&%QT High Speed Draft &%QU Utility &%QL Near Letter Quality Courier &%QS Near Letter Quality Sans Serif
EPOS	[ESC] x <n> and/or [ESC] ! <n>
Description	This command begins utility or NLQ print mode.
Where n	0 = HSD Mode 1 = Utility Mode 2 = NLQ Courier 3 = NLQ Sans Serif 4 - 7 repeats 0 - 3 Utility is a 1 pass, 9 x 7 font. Utility print mode enables enhanced, emphasized, subscript, superscript, and underline character attributes. Print speed is reduced approximately 20% over HSD mode. NLQ Courier and Sans Serif print modes are each 2 pass, 9 x 7 fonts. The print speed is reduced and character features are added to the font to enhance the appearance. **EPOS Note:** [ESC] x is identical to [ESC] I in normal mode. [ESC]!<n> performs a similar function; however, NLQ is not available.

Where n-bits

76543210	Function
1-------	Underline
--1-----	Double-wide
---1----	Double-high
-------X	Font: 1 = Utility, 0 = HSD

Function	**Begin 90° rotated font**
ASCII	[ESC] P <1>
Hexadecimal	1BH 50H 1H
Decimal	<27><80><1>
IPCL	&%RF{n=1},&%RN{n=0}
EPOS	[ESC]V<n>
Description	This command rotates the print font by 90°. The print font is a 1 pass, 7 x 10 font. Enhanced, emphasized, subscript, superscript, and underline character attributes are not available in this mode. Double-wide and double-high print are available in 90° rotated mode. However, because the font is rotated, double-wide print will make the characters taller and double-high print will make the characters wider. The current pitch sets the spacing between lines. If 8 cpi is set, the printer will produce the equivalent of 8 lines per inch rotated print. Print pitches greater than 12 cpi are very small and difficult to read. This mode prints faster than the formatted, rotated print mode. However, there is no formatting in this mode. **Note:** Line graphic characters (<176> to <223>) print unrotated. **EPOS Note:** In EPOS mode if <n> = 0, rotation is turned off. If <n> = 1, the pitch is set to 10 cpi. If <n> = 2, the cpi is set to 8.

Function	**Begin 270° rotated font**
ASCII	[ESC] P <2>
Hexadecimal	1BH 50H 2H
Decimal	<27><80><2>
IPCL	&%RF{n=2},&%RN{n=0}
EPOS	none
Description	This command rotates the print font by 270°. The print font is a 1 pass, 7 x 10 font. Enhanced, emphasized, subscript, superscript, and underline character attributes are not available in this mode. Double-wide and double-high print are available in 270° rotated mode. However, because the font is rotated, double-wide print will make the characters taller and double high will make the characters wider.

Function	**End rotated font**
ASCII	[ESC] P <0>
Hexadecimal	1BH 50H 0H
Decimal	<27><80><0>
IPCL	&%RN
EPOS	[ESC]V<n>
Description	This command returns the print font to normal nonrotated mode. **Note:** This command leaves the printer in utility mode.

International Character Sets and Code Pages

The Series 150 Printer supports 65 different international character sets. In IBM and EPOS printers, there has historically been two ways of selecting a character set. The first way substitutes international characters in the upper 128 characters of a the standard character set to support different countries. As time went on, this approach became difficult to support. It became a problem for the application to match the characters displayed and the characters printed. To solve this problem, code pages were developed. The printer and the display could use the same code page and the application would then display and print the same characters. IBM and EPOS defined new commands to select code pages and left the old commands in effect.

The Series 150 Printer supports international character sets as well as code pages. However, both methods are extended in the Series 150. This is to allow the most flexibility for the application programmer. In IBM mode, there are 19 character sets and 60 code pages. In EPOS mode, there are 57 character sets and five code pages.[7]

The Series 150 Printer has extended the IBM code page selection command to allow the character sets as well as normal IBM code pages to be selected. The EPOS character set select command has been extended to allow additional character sets over and above the 11 defined by EPOS. The EPOS code page select command has not been extended as there is no EPOS definition beyond the first six ID's.

All characters in code pages as well as character sets are addressed as 0 - 255. (Characters below 32 must be addressed with the [ESC]^<n> command.) Code pages may be changed at any time and are active for all features including rotated print.

As discussed above, there are two commands for language selection in IBM mode. The first is [ESC] ! which will select one of 19 international character sets. This command will not select all the possible sets and is provided for compatibility with older programs. The second is [ESC] [T which will select any of the 58 code pages. In EPOS mode, the command [ESC] R has been expanded and will select any of the 59 international character sets or code pages.

Function	**Select international character set**
ASCII	[ESC] ! <n>
Hexadecimal	1BH 21H
Decimal	<27><33>
IPCL	&%CS<n>
EPOS	[ESC] R <n>
Description	This command selects the international character set, <n>. In standard mode, the value of <n> is as follows:

[7] Epson provides limited code page support through ID to code page translation. Only six translations are defined.

<n>	Language	<n>	Language	<n>	Language
64-'@'	ASCII (slashed zero)	71-'G'	Norwegian	78-'N'	Swedish IV
65-'A'	ASCII (unslashed zero)	72-'H'	Dutch	79-'O'	Turkish
66-'B'	British	73-'I'	Italian	80-'P'	Swiss I
67-'C'	German	74-'J'	French Canadian	81-'Q'	Swiss II
68-'D'	French	75-'K'	Spanish	90-'Z'	Publisher
69-'E'	Swedish	76-'L'	Swedish II		
70-'F'	Danish	77 -'M'	Swedish III		

Table 5 Language tables ID

Country Code/ Language Set	Epson ID	Country Code/ Language Set	Epson ID	Country Code/ Language Set	Epson ID
ASCII	0	Swiss II	20	Windows Greek	50
French	1	Cyrillic II-866	21	Latin 5 (Windows Turkey)	51
German	2	Polska Mazovia	22	Windows Cyrillic	52
British	3	ISO Latin 2	23	Hungarian CWI	54
Danish I	4	Serbo Croatic I	24	Kamenicky (MJK)	55
Swedish I	5	Serbo Croatic II	25	ISO Latin 4 (8859/4)	56
Italian	6	Multilingual	26	Turkey_857	57
Spanish I	7	Norway	27	Roman-8	58
Japanese	8	Portugal	28	Hebrew NC (862)	60
Norwegian	9	Turkey	29	Hebrew OC	61
Danish II	10	Greek 437	38	Windows Hebrew	62
Spanish II	11	Greek 928	39	KBL- Lithuanian	63
Latin American	12	Greek 437 CYPRUS	41	Publisher	64
French Canadian	13	ECMA-94	42	Ukrainian	66
Dutch	14	Canada French	43	ISO Latin 6 (8859/10)	67
Swedish II	15	Cyrillic I-855	44	Windows Baltic	68
Swedish III	16	Cyrillic II-866	45	Cyrillic-Latvian	69
Swedish IV	17	East Europe Latin II-852	46	Bulgarian	72
Turkish	18	Greek 869	47	Icelandic-861	73
Swiss I	19	Windows East Europe	49	Baltic 774	74

Table 6 EPOS language tables ID

Note: There is a demonstration script distributed with the CFG150 program that will print a complete character chart for IBM or EPOS modes. See the CFG150 distribution disk.

Function	**Select character code page**
ASCII	[ESC] [T <n_h> <n_l>
Hexadecimal	1BH 5BH 54H <n_h> <n_l>
Decimal	<27><91><84><n_h> <n_l>
IPCL	&%CP <m_1> <m_2><m_3><m_4>
EPOS	[ESC] t <n>

Description This command selects the character code page <n_h> <n_l>. The Series 150 Printer supports many code pages. The following code pages are supported.

Code Page	Country Code/ Language Set	Decimal <n_h> <n_l>	Hex <n_h> <n_l>	Code Page	Country Code/ Language Set	Decimal <n_h> <n_l>	Hex <n_h> <n_l>
64	USA (slashed zero)	0,64	0H,040H	866	Cyrillic II-866	3,98	3H,062H
65	USA (unslashed zero)	0,65	0H,041H	869	Greek 869	3,101	3H,065H
66	British	0,66	0H,042H	874	Thailand	3,106	3H,06AH
67	German	0,67	0H,043H	895	Kamenicky (MJK)	3,127	3H,07FH
68	French	0,68	0H,044H	1008	Greek 437	3,240	3H,0F0H
69	Swedish I	0,69	0H,045H	1009	Greek 928	3,241	3H,0F1H
70	Danish	0,70	0H,046H	1011	Greek 437 CYPRUS	3,243	3H,0F3H
71	Norwegian	0,71	0H,047H	1012	Turkey	3,244	3H,0F4H
72	Dutch	0,72	0H,048H	1013	Cyrillic II-866	3,245	3H,0F5H
73	Italian	0,73	0H,049H	1014	Polska Mazovia	3,246	3H,0F6H
74	French Canadian	0,74	0H,04AH	1015	ISO Latin 2	3,247	3H,0F7H
75	Spanish	0,75	0H,04BH	1016	Serbo Croatic I	3,248	3H,0F8H
76	Swedish II	0,76	0H,04CH	1017	Serbo Croatic II	3,249	3H,0F9H
77	Swedish III	0,77	0H,04DH	1018	ECMA-94	3,250	3H,0FAH
78	Swedish IV	0,78	0H,04EH	1019	Windows East Europe	3,251	3H,0FBH
79	Turkish	0,79	0H,04FH	1020	Windows Greek	3,252	3H,0FCH
80	Swiss I	0,80	0H,050H	1021	Latin 5 (Windows Turkey)	3,253	3H,0FDH
81	Swiss II	0,81	0H,051H	1022	Windows Cyrillic	3,254	3H,0FEH
90	Publisher	0,90	0H,05AH	1024	Hungarian CWI	4,0	4H,000H
91	Welsh	0,91	0H,05BH	1026	ISO Latin 4 (8859/4)	4,2	4H,002H
437	USA	1,181	1H,0B5H	1027	Ukrainian	4,3	4H,003H
774	Baltic 774	3,6	3H,006H	1028	Roman-8	4,4	4H,004H
850	Multilingual	3,82	3H,052H				
852	East Europe Latin II-852	3,84	3H,054H	1029	ISO Latin 6 (8859/10)	4,5	4H,005H
855	Cyrillic I-855	3,87	3H,057H	1030	Hebrew NC (862)	4,6	4H,006H
857	Turkey 857	3,89	3H,059H	1031	Hebrew OC	4,7	4H,007H
860	Portugal	3,92	3H,05CH	1032	Windows Hebrew	4,8	4H.008H
861	Icelandic-861	3,93	3H,05DH	1033	KBL- Lithuanian	4,9	4H,009H
862	Hebrew NC (862)	3,94	3H,05EH	1034	Windows Baltic	4,10	4H,00AH
863	Canada French	3,95	3H,05FH	1035	Cyrillic-Latvian	4,11	4H,00BH
865	Norway	3,97	3H,061H	1072	Bulgarian	4,48	4H,030H

Table 7 Code page definition table

Note: The code page field is a 16-bit field that is equivalent to the code page number. For example, 1 * 256 + 181 = 437. For the IPCL command, the page is specified in ASCII as a 4-byte field.

EPOS Note: EPOS defines <n> as follows:

<n>	Character Code Page	<n>	Character Code Page
0	Code Page 437	3	Code Page 860
1	Not supported	4	Code Page 863
2	Code Page 850	5	Code Page 865

Table 8 EPOS code page definition table

Function **Print control character**

ASCII [ESC] ^ <n>
Hexadecimal 1BH 5EH <n>
Decimal <27><94<n>
IPCL &%CC <m_1> <m_2><m_3>
EPOS [ESC] ^ <n>

Description This command allows characters from 0 to 31 codes to be printed. During normal operation, characters from 0 to 31 are control characters. This command turns off control code translation for the following character. <n> can be from 0 to 255.

Function **Character font image download**

ASCII [ESC] = <n1><n2><start code> <data>
Hexadecimal 1BH 3DH <n1><n2><start code><data>
Decimal <27><61><n1><n2><start code><data>
IPCL none
EPOS none

Description This command allows custom characters to be downloaded. The total count is [(number of characters x 9)+1] = (n1+256*n2). The start code is the starting character where the download is to start.

Function **Copy ROM Character Set to RAM Character Set**

ASCII [ESC] $
Hexadecimal 1BH 24H <n>
Decimal <27><36>
IPCL none
EPOS none

Description This command copies the internal ROM character set to the RAM character set.

Function **Custom character set ON**

ASCII [ESC] > <n>
Hexadecimal 1BH 3EH <1>
Decimal <27><62<1>
IPCL none
EPOS none

Description This selects the custom character set contained in the RAM font buffer.

Function	**Custom character set OFF**
ASCII	[ESC] > <n>
Hexadecimal	1BH 3EH <0>
Decimal	<27><62<0>
IPCL	none
EPOS	none
Description	This command turns off the custom character set contained in the RAM font buffer.

Character Print Control

There are a number of character pitch and print mode operations that are possible and a few that are not. The following table lists the operations that are possible in matrix form.

Some features switch to an alternate mode while active. For example, if line graphics are to be printed the printer always prints them in a two-pass utility font at the selected pitch.

Some enhanced or emphasized print formats are not available in 15 to 24 cpi.

Rotated 180° print fully supports all print features. Rotated 90° and 270° print in a 5 x 7 font at 72 dpi is equivalent to a 12 cpi HSD font. Rotated print supports 10 cpi and 12 cpi by controlling the line spacing.

Operation	8 cpi	10 cpi	12 cpi	15 cpi	17 cpi	20 cpi	24 cpi	Line gph	Ital	Super /sub	Util	NLQ	HSD	Emph	Enhan	Dbl wide	Dbl high	Under /over
8 cpi								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
10 cpi								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
12 cpi								✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
15 cpi								✓	✓	✓	✓	☹	✓	☹	☹	✓	✓	✓
17 cpi								✓	✓	✓	✓	☹	✓	☹	☹	✓	✓	✓
20 cpi								✓	✓	✓	✓	☹	✓	☹	☹	✓	✓	✓
24 cpi								✓	✓	✓	✓	☹	✓	☹	☹	✓	✓	✓
Line graphics	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	☹	☹	✓	✓	☹
Italics	✓	✓	✓	✓	✓	✓	✓				✓	✓	☹	✓	✓	✓	✓	✓
Supercript/ subscript	✓	✓	✓	✓	✓	✓	✓				✓	✓	☹	✓	✓	✓	✓	✓
Utility	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				✓	✓	✓	✓	✓
NLQ	✓	✓	✓	☹	☹	☹	☹	✓	✓	✓						✓	✓	✓
HSD	✓	✓	✓	✓	✓	✓	✓	✓	☹	☹				☹	☹	✓	✓	☹
Emphasized	✓	✓	✓	☹	☹	☹	☹	☹	✓	✓	✓		☹			☹	☹	✓
Enhanced	✓	✓	✓	☹	☹	☹	☹	☹	✓	✓	✓		☹			☹	☹	✓
Double-wide	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	☹	☹			✓
Double-high	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	☹	☹			✓
Underline/ Overline	✓	✓	✓	✓	✓	✓	✓	☹	✓	✓	✓	✓	☹	✓	✓	✓	✓	
Rotate 90°/270°	☹	✓	✓	☹	☹	☹	☹	✓	☹	☹	☹	☹	☹	☹	☹	☹	☹	☹

Table 9 Print modes

Notes: ✓ Feature available
☹ Feature not available

Character Pitch

Function	**Begin 10 cpi character pitch**
ASCII	[DC2]
Hexadecimal	12H
Decimal	<18>
IPCL	&%F3
EPOS	[ESC][SP] <n>
Description	This command sets 10 character per inch print pitch.

Function	**Begin 12 cpi character pitch**
ASCII	[ESC] :
Hexadecimal	1BH 3AH
Decimal	<27><58>
IPCL	&%F2
EPOS	[ESC][SP] <n>
Description	This command sets 12 character per inch print pitch.

Function	**Begin 17 cpi character pitch**
ASCII	[SI]
Hexadecimal	0FH
Decimal	<15>
IPCL	&%F1
EPOS	[ESC][SP] <n>
Description	This command sets 17 character per inch print pitch

Function	**Begin 24 cpi character pitch**
ASCII	[ESC] [SI]
Hexadecimal	1BH 0FH
Decimal	<27><15>
IPCL	&%F4
EPOS	[ESC][SP] <n>
Description	This command sets 24 character per inch print pitch

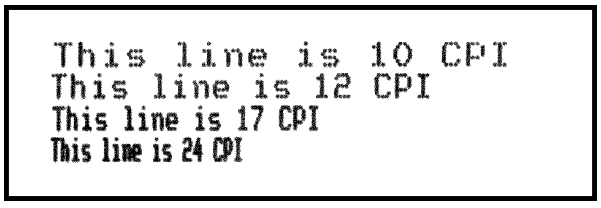


Figure 9 Examples of character print

Function **Set specified character pitch**

ASCII [ESC] [P <n>
Hexadecimal 1BH 5BH 50H <n>
Decimal <27> <91> <80> <n>
IPCL &%F<n>
EPOS [ESC][SP] <n>

Description This command sets characters per inch print pitch to <n>

Where n			
	<8>	selects 8 cpi	&%F7
	<10>	selects 10 cpi	&%F3
	<12>	selects 12 cpi	&%F2
	<15>	selects 15 cpi	&%F6
	<17>	selects 17 cpi	&%F1
	<20>	selects 20 cpi	&%F5
	<24>	selects 24 cpi	&%F4

Function **Set intercharacter spacing**

Mode Global
ASCII [ESC] V <n>
Hexadecimal 1BH 56H <n>
Decimal <27> <86> <n>
IPCL none
EPOS [ESC][SP] <n>

Description Set intercharacter spacing by adding white space between characters. The value of <n> sets the spacing and can range from 0 to 11. The normal pitch set commands set the intervalue to 0. The amount of space depends on the pitch that was set. The following table specifies the amount of white space for each pitch setting

Pitch	Spacing	Pitch	Spacing
HSD 8 cpi	1/80 * n	Utility/NLQ 8 cpi	1/150 * n
HSD 10 cpi	1/100 * n	Utility/NLQ 10 cpi	1/120 * n
HSD 12 cpi	1/120 * n	Utility/NLQ 12 cpi	1/144 * n
HSD 15 cpi	1/150 * n	Utility/NLQ 15 cpi	1/180 * n
HSD 17 cpi	1/171 * n	Utility/NLQ 17 cpi	1/205 * n
HSD 20 cpi	1/200 * n	Utility/NLQ 20 cpi	1/240 * n
HSD 24 cpi	1/240 * n	Utility/NLQ 24 cpi	1/288 * n

Table 10 Intercharacter spacing table

Character Attribute Commands

Function	**Begin one-line double-wide print**
ASCII	[SO]
Hexadecimal	0EH
Decimal	<14>
IPCL	&%MW
EPOS	none
Description	This command causes subsequent characters to be printed at twice the currently selected character width. For example 10 cpi becomes 5 cpi, 17 cpi becomes 8.5 cpi, and so on. This command will remain in effect until: a. a valid line terminator is received (CR, LF, or fine line feed); b. the command is canceled; or c. the maximum number of characters per line is reached and the printer performs an auto print.

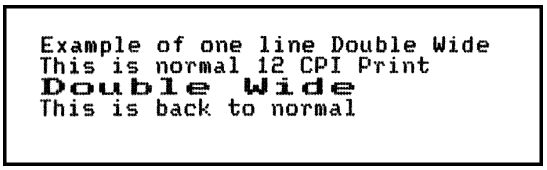


Figure 10 Example of one-line double-wide print

```
Example of one line Double Wide[CR][LF]
This is normal 12 cpi Print[CR][LF]
[SO]
Double Wide[CR][LF]
This is back to normal[CR][LF]
```

Figure 11 Data sent to printer for one-line double-wide print

Function	**Cancel one-line double-wide print**
ASCII	[DC4]
Hexadecimal	14H
Decimal	<20>
IPCL	&%MN
EPOS	none
Description	This command cancels one-line double-wide mode set by the [SO] command and allows single- and double-wide characters to be printed on the same line.

Function **Multiline double-wide and double-high**

ASCII [ESC] W <n>
Hexadecimal 1BH 57H <n>
Decimal <27><87><n>
IPCL &%FD, &%FS, &%FH (Note: Single-wide, double-high print is not available in IPCL).
EPOS [ESC] ! <n>

Description This command controls multiline double-wide or double-high mode

Where

n	specifies the mode	
0	begins standard single-wide and single-high	&%FS
1	begins double-wide	&%FD
2	begins double-high	none
3	begins double-wide, double-high	&%FH

Note: This command does not affect line spacing.

EPOS Note: [ESC]!<n> performs a similar function; however, NLQ is not available.

Where n-bits

76543210	Function
1-------	Underline
--1-----	Double-wide
---1----	Double-high
-------X	Font: 1 = Utility, 0 = HSD

Function **Set print style: double-wide, double-high, italic control**

ASCII [ESC] [@ [EOT] [NUL] <k> [NUL] <n> <m>
Hexadecimal 1BH 5BH 40H 04H 00H <k> 00H <n> <m>
Decimal <27><91><64> <04> <0> <K> <0> <n> <m>
IPCL &%DH Double-high, double-wide, and double-space
&%SH Single-high, single-wide, and single-space
Also, see [ESC] W.

Description This command sets double-wide, double-high, and italic print mode

Where

k-bits	76543210	
	----xxxx	Italic control
0	----0000	No change
1	----0001	Italic ON
2	----0010	Italic OFF

Where

n-bits	76543210	
	----xxxx	Height multiplier
0	----0000	No change
1	----0001	Single height
2	----0010	Double height
	xxxx----	Line spacing
0	0000----	No change
16	0001----	Single line feed
32	0010----	Double line feed

Where

m-bits	76543210	
	----xxxx	Width multiplier
0	----0000	No change

1	`----0001`	Single-wide
2	`----0010`	Double-wide

Function	**Begin underline**
ASCII	[ESC] - <1>
Hexadecimal	1BH 2DH 01H
Decimal	<27><45><1>
IPCL	&%MU
EPOS	[ESC]!<n>
Description	This command begins the underline print mode. All subsequent text and leading spaces will be underlined. Trailing spaces are also underlined. **Note:** Underline is not available in HSD mode. See page 29 for available modes. **EPOS Note:** [ESC]!<n> performs a similar function; however, NLQ is not available.

Where n-bits

76543210	Function
1-------	Underline
--1-----	Double-wide
---1----	Double-high
-------X	Font: 1 = Utility, 0 = HSD

Function	**End underline**
ASCII	[ESC] - <0>
Hexadecimal	1BH 2DH 00H
Decimal	<27><45><0>
IPCL	&%CU
EPOS	none
Description	This command ends underline print mode.

Function	**Begin overscore**
ASCII	[ESC] _ <1>
Hexadecimal	1BH 5FH 01H
Decimal	<27><95><1>
IPCL	&%MO
EPOS	none
Description	This command begins overscore print mode. All subsequent text and leading spaces will be overscored. Trailing spaces are also overscored. **Note:** Overscore is not available in HSD mode. See page 29 for available modes.

Function	**End overscore**
ASCII	[ESC] _ <0>
Hexadecimal	1BH 5FH 00H
Decimal	<27><95><0>
IPCL	&%CO
EPOS	none
Description	This command ends overscore print mode.

Function	**Begin enhanced print**
ASCII	[ESC] G
Hexadecimal	1BH 47H
Decimal	<27><71>
IPCL	&%ME
EPOS	[ESC] G <1>
Description	This command begins enhanced print mode. All subsequent text will be printed in enhanced print mode (2 pass with a vertical offset). Enhanced printing provides a deeper resolution of each character and may enhance multiple part forms printing. **Note:** This feature is not available in all print modes. See page 29 for available modes.

Function	**End enhanced print**
ASCII	[ESC] H
Hexadecimal	1BH 48H
Decimal	<27><72>
IPCL	&%CE
EPOS	[ESC] G <0>
Description	This command cancels enhanced print mode and returns to the currently selected font.

Function	**Begin emphasized print**
ASCII	[ESC] E
Hexadecimal	1BH 45H
Decimal	<27><69>
IPCL	&%MM
EPOS	[ESC] E <1>
Description	This command begins emphasized print mode (1 pass with horizontal offset). This print is bolder than normal print.

Function	**End emphasized print**
ASCII	[ESC] F
Hexadecimal	1BH 46H
Decimal	<27><70>
IPCL	&%CM
EPOS	[ESC] E <0>
Description	This command cancels emphasized print mode.

Function	**Select superscript**
ASCII	[ESC] S <0>
Hexadecimal	1BH 53H 00H
Decimal	<27><83><0>
IPCL	&%SP
EPOS	none
Description	This command selects superscript. All following characters will be printed half size on the upper side of the print line. **Note:** This feature is not available in all print modes. See page 29 for available modes.

Function	**Select subscript**
ASCII	[ESC] S <1>
Hexadecimal	1BH 53H 01H
Decimal	<27><83><1>
IPCL	&%SB
EPOS	none
Description	This command selects subscript. All following characters will be printed half size on the bottom side of the print line. **Note:** This feature is not available in all print modes. See page 29 for available modes.

Function	**End superscript or subscript**
ASCII	[ESC] T
Hexadecimal	1BH 54H
Decimal	<27><84>
IPCL	&%SE
EPOS	none
Description	This command cancels superscript or subscript.

Function	**Begin italics**
ASCII	[ESC] % G
Hexadecimal	1BH 25H 47H
Decimal	<27><37><71>
IPCL	&%MI
EPOS	[ESC] 4
Description	This command begins italics print mode. **Note:** Italics are not available in all print modes. See page 29 for available modes.

Function	**End italics**
ASCII	[ESC] % H
Hexadecimal	1BH 25H 48H
Decimal	<27><37><48>
IPCL	&%CI
EPOS	[ESC] 5
Description	This command ends italic print mode.

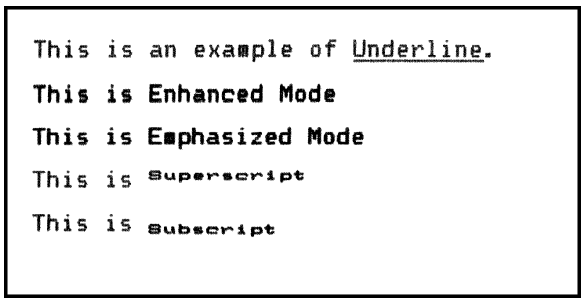


Figure 12 Example of underline, enhanced, emphasized, superscript, and subscript print

Print Rotation Commands

To provide printing flexibility on preprinted and various size forms, rotated print capability is available in validation and receipt modes. Rotated print mode aligns the print in any of three 90 degree orientations.

In 90° and 270° rotated modes, the print data is first buffered by the printer, processed (rotated), and then printed. This causes the print process to be delayed slightly as it takes some time to process the data before it is printed. In 180° mode, the print is simply inverted and mirrored.

Because the rotated 90° and 270° print buffer is limited to 1760 characters, the amount of rotated print is also limited. The printer can support a limit of 22 lines of rotated print with a maximum line length is 80 characters. The technique used by the Series 150 Printer is to receive all the print to be rotated and convert it into graphics. This requires buffer space for all possible characters in each print line. Each line has a fixed length buffer regardless of how much data is actually sent to the printer. The printer will space fill the buffer for each line to the maximum size. As a result, a short line of two characters will take as much buffer space as a long line.

To make the most efficient use of buffer space the line length is predefined. The default line length is 80 characters, which leaves room for 22 lines. To allow longer lines to be printed, the line length can be changed; however, no more than 22 lines with no more than 128 characters per line are allowed. For example, if the line length is expanded to 128 characters per line, there is buffer space for 1760/128 or 13 lines.

Specifying the line length is also useful to determine where data is printed on forms. In rotated 90° and 270° mode, the print field can be extended to print the complete line length specified. Extending the line length is useful for printing forms such as checks where the form is fixed but the data can change. This mode is called line formatted mode. In line formatted mode, the line length is set not by the longest line entered but by the maximum line length. (Line lengths less than 80 will not print more than 22 lines, only the format will be affected).

The space between lines is controlled by a line spacing table. The table is defined by the rotated print line spacing ([ESC] u ...) command or by inserting [LF] or [ESC]J<n> commands in the rotated data. The [ESC]u command specifies the number of dots to be added between each printed line. Each line has an entry in the table. There is room for 22 lines in the table. The minimum spacing (and default) is one dot or 1/80 of an inch between lines which results in a total of 10 dots in a line or 10/80 of an inch (8 lines per inch).

The character cell is 7 x 9 with one dot of white space[8] or 7 x 10 total cell size. This cell is printed at 80 dots per inch. If 3 dots are added, there will be four dots total, and the cell will be 7 x 13. The following table specifies lines per inch for various numbers of inserted dots.

Number of dots added	0	1	2	3	4	5	6	7
Spacing specified	1	2	3	4	5	6	7	8
Cell size	7 x 10	7 x 11	7 x 12	7 x 13	7 x 14	7 x 15	7 x 16	7 x 17
Line spacing (inches)	0.125	0.1375	0.15	0.1625	0.175	0.1875	0.2	0.2125
Number lines per inch	8	7.27	6.67	6.15	5.71	5.33	5.0	4.7

Table 11 Rotated print spacing

[8] Line graphic characters are 7 x 10 which allow touching characters as a default.

If a [LF] is used to specify the line spacing, it overrides the default table and sets spacing to 1 dot for 8 lines per inch. If [ESC]J<n> is used, <n> specifies the spacing in n/216 (including the one dot white space). Note: the finest resolution is still 1/80, n/216 will be rounded to the nearest n/80 and the smallest value allowed will be 1/80.

In rotated 90° or 270° mode, the print is done in APA[9] graphics. The intercharacter spacing is adjusted with the normal line spacing commands. The [ESC]3<n> command is the most effective command for adjusting intercharacter spacing. Line spacing smaller than 12 cpi will force the characters to overlap. (Spacing of 12 cpi is obtained with an [ESC] 3 <18>.)

When 90° or 270° rotation is selected, only normal text can be printed. Underline, enhanced, emphasized, and other attributes will not function. See the chart on page 29 for a list of available features.

In 180° rotation mode, all spacing commands are effective. This mode of operation simply inverts and mirrors the print operation. All line spacing and print features are available. It should be noted that the feed direction is not effected by any of the rotate commands.

Function	**Begin 90° rotated print**
ASCII	[ESC] r <1>
Hexadecimal	1BH 72H 01H
Decimal	<27><114><1>
IPCL	&%R1
EPOS	[ESC] T <3>
Description	Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data. **EPOS Note:** The M150 Printer does not fully implement EPOS page mode. The [ESC] T <n> command functions identically to the normal mode [ESC] r <n> except the definition of <n> is different.

Function	**Begin 90° rotated print with line formatting**
ASCII	[ESC] r <5>
Hexadecimal	1BH 72H 05H
Decimal	<27><114><5>
IPCL	&%R5
EPOS	[ESC] T <3>
Description	Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data. This command differs from the [ESC] r <1> command in that the line length is determined not by the longest line entered, but by the line length set by the [ESC] s command. If input extends past the end of a line, it will line wrap.

[9]APA - All Points Addressable

Function	**Begin 270° rotated print**
ASCII	[ESC] r <3>
Hexadecimal	1BH 72H 03H
Decimal	<27><114><3>
IPCL	&%R3
EPOS	[ESC] T <1>
Description	Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data. The print will be rotated 270° according to the currently stored format parameters. **EPOS Note:** The M150 Printer does not implement EPOS page mode. The [ESC] T <n> command functions identically to the normal mode [ESC] r <n> except the definition of <n> is different.

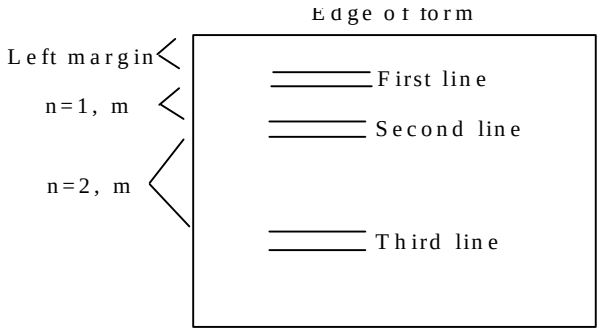
Function	**Begin 270° rotated print with line formatting**
ASCII	[ESC] r <7>
Hexadecimal	1BH 72H 07H
Decimal	<27><114><7>
IPCL	&%R7
EPOS	[ESC] T <1>
Description	Print data is entered normally from left to right, top to bottom. When an end rotated print ([ESC] r <0>) command is received, the printer formats and prints the data. The print will be rotated 270° according to the currently stored format parameters. This command differs from the [ESC] r <3> command by spacing out the lines to the line length specified by the [ESC] s command. If input extends past the end of a line, it will line wrap.

Function	**Begin 180° rotated print**
ASCII	[ESC] r <2>
Hexadecimal	1BH 72H 02H
Decimal	<27><114><2>
IPCL	&%R2
EPOS	[ESC] { <1>
Description	All subsequent lines will be rotated 180° and positioned at the opposite margin. This command is effective on all stations including the journal. This command will remain in effect until rotation is canceled with an end rotated print ([ESC] r <0>) command, or a station select command is issued. **Note:** The last line of print must be terminated with a line terminator before the end rotated command is issued. Any characters in the print buffer that have not been printed will not be printed. They will be printed unrotated when a line terminator is received.

Function	**End rotated print**
ASCII	[ESC] r <0>
Hexadecimal	1BH 72H 00H
Decimal	<27><114><0>
IPCL	&%R0
EPOS	[ESC] { <0>
Description	This command prints the contents of the rotated print buffer (if 90° or 270° mode) and returns to normal print orientation. In 180° mode, the printer will return to normal print orientation. Characters in the print buffer that have not been printed will not be printed.

Function	**Set rotated print line length**
ASCII	[ESC] s <n>
Hexadecimal	1BH 73H <n>
Decimal	<27><115><n>
IPCL	&%RL <m_1> <m_2><m_3>
EPOS	none
Description	This command sets the print line length to be used in auto format rotated print mode. The maximum number of characters is 128 per line. The power on default line length is 80 characters. The number of available print lines is found by dividing 1760 by the number of characters per line and rounding down to the nearest whole number. The minimum number is 80 characters. Any value less than 80 will not allow any additional lines to be printed. Values greater than 80 will limit the number of lines to less than 22.

Function	**Set rotated print line spacing**
ASCII	[ESC] u <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> <0>
Hexadecimal	1BH 75H <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> 00H
Decimal	<27><117> <n_1> <m_1> <n_2> <m_2> ... <n_i> <m_i> <0>
IPCL	none
EPOS	none
Description	This command adjusts the line spacing for each rotated print line where n_i is the line number and m_i is the spacing in dot columns (1/80") from the previous line.



For the first print line, the distance is calculated from the margin. An n_i value of 0 is used to terminate the command. Any unspecified spacing will be set to 1. This allows data to be accurately positioned on an inserted form. These values will be used as a template for all subsequent rotated print. On power up, all spacing is preset to 1/80" (n=1, 8 lines per inch) for all lines. This command is only effective in 90° and 270° rotation. It will remain in effect until a new table is received or until the printer is power cycled. An [ESC] u <0> will have the effect of setting all lines to 1. This table can be overridden by [LF] or [ESC] J <n> commands in the rotated print data.

The value of m can be from 1 to 127; n can be from 1 to 22.

Table 11 on 39 specifies the line spacing for this command.

Graphic Mode

The Series 150 Printer conforms to the full definition of IBM APA graphic commands. The printer will only print graphics that are 2.4 inches wide. This at times can make it difficult to use off-the-shelf graphic generation programs.

If the Series 150 Printer is used with programs that convert text to graphics, the printer will be slower than if the printer is sent ASCII text. The Series 150 is supported by a Windows' print driver that will allow applications to select fonts that are supported by the printer.

The Series 150 Printer is not designed to print large quantities of graphical data. If the printer is asked to print an excessive amount of black, it will break down the job into multiple steps. This protects the printer but slows the printing time. The printer should not be requested to print a white on black image.

Standard APA Graphics

Function	**Print single-density graphics (60 h x 72 v dpi)**
ASCII	[ESC] K <n>1 <n>2
Hexadecimal	1BH 4BH <n>1 <n>2
Decimal	<27><75><n>1 <n>2
IPCL	none
Description	This command prints n1 + 256*n2 bytes of single-density graphics (60 dpi).

Function	**Print half-speed double-density graphics (120 h x 72 v dpi)**
ASCII	[ESC] L <n>1 <n>2
Hexadecimal	1BH 4CH <n>1 <n>2
Decimal	<27><76><n>1 <n>2
IPCL	none
Description	This command prints n1 + 256*n2 bytes of double-density graphics (120 dpi) half-speed allowing full and half dots to be printed.

Function	**Print full-speed double-density graphics (120 h x 72 v dpi)**
ASCII	[ESC] Y <n>1 <n>2
Hexadecimal	1BH 59H <n>1 <n>2
Decimal	<27><89><n>1 <n>2
IPCL	none
Description	This command prints n1 + 256*n2 bytes of double-density graphics (120 dpi) full speed, no consecutive dots. (This mode is generally used to print 120 h by 144 v dpi resolutions in two passes).

Function	**Print quad-density graphics (240 h x 72 v dpi)**
ASCII	[ESC] Z <n>1 <n>2
Hexadecimal	1BH 5AH <n>1 <n>2
Decimal	<27><90><n>1 <n>2
IPCL	none

Description This command prints n1 + 256*n2 bytes of double-density graphics (120 dpi) full speed, no consecutive dots. (Quad-density graphic mode is generally used to print 240 h by 144 v dpi resolutions in two passes)

Function **Print graphics in mode <n> (60 h/120 h/240 h x 72 v dpi)**

ASCII [ESC] * <m> <n>[1] <n>[2]
Hexadecimal 1BH 2AH <m><n>[1] <n>[2]
Decimal <27><42><m><n>[1] <n>[2]
IPCL none

Description This command selects one of the three above graphics modes as specified by <m>.

Where <m>				
	0	60 dpi	Full speed	8-bit slices
	1	120 dpi	Half speed	8-bit slices
	2	120 dpi	Full speed	8-bit slices
	3	240 dpi	Full speed	8-bit slices
	4	80 dpi	Full speed	8-bit slices
	5	72 dpi	Full speed	8-bit slices
	6	90 dpi	Full speed	8-bit slices
	7	144 dpi	Full speed	8-bit slices
	8,9,11,12,13,14,16		Not supported	

Function **Reassign graphic mode**

ASCII [ESC] ? <m> <n>
Hexadecimal 1BH 3FH <m><n>
Decimal <27><63><m><n>
IPCL none

Description This command reassigns graphic mode <m> to resolution <n>. Possible values for <m> are K, L, Y or Z. Resolutions <n> are 0 through 7 as follows:

Where <m>					
	0	60 dpi	Full speed	8-bit slices	Default for K
	1	120 dpi	Half speed	8-bit slices	Default for L
	2	120 dpi	Full speed	8-bit slices	Default for Y
	3	240 dpi	Full speed	8-bit slices	Default for Z
	4	80 dpi	Full speed	8-bit slices	
	5	72 dpi	Full speed	8-bit slices	
	6	90 dpi	Full speed	8-bit slices	
	7	144 dpi	Full speed	8-bit slices	

Function **Begin unidirectional print**

ASCII [ESC] U <1>
Hexadecimal 1BH 55H 01H
Decimal <27><85><1>
IPCL &%GU
EPOS [ESC] U <1>

Description This command prints all data in unidirectional print mode to improve line to line registration for graphical data.

Note: This command should be canceled before normal text is printed. It will slow printing time if it is not canceled.

Function	**Begin bidirectional print**
ASCII	[ESC] U <0>
Hexadecimal	1BH 55H 00H
Decimal	<27><85><0>
IPCL	&%GB
EPOS	[ESC] U <0>
Description	This command prints all data in bidirectional, logic-seeking print mode.

EPOS Bit Image Graphics

Function	**Print single-density graphics**
ASCII	[ESC] * <m> <n>^{1} <n>^{2}
Hexadecimal	1BH 4BH <n>^{1} <n>^{2}
Decimal	<27><75><n>^{1} <n>^{2}
Description	Print n1 + 256*n2 bytes of graphics where m specifies the density.

Where m	0	Single-density graphics	60 dpi
	1	Double-density graphics	120 dpi
	2	Double-density half-speed graphics	120 dpi
	3	High-density graphics	240 dpi
	4, 5	CRT II screen	72 dpi
	6	CRT I screen	90 dpi
	7	Dual plotter	144 dpi

Function	**Begin unidirectional print**
ASCII	[ESC] U <1>
Hexadecimal	1BH 55H 01H
Decimal	<27><85><1>
Description	This command prints all data in unidirectional print mode to improve line to line registration for graphical data. **Note:** This command should be canceled before normal text is printed. It will slow printing time if it is not canceled.

Function	**Begin bidirectional print**
ASCII	[ESC] U <0>
Hexadecimal	1BH 55H 00H
Decimal	<27><85><0>
Description	This command prints all data in bidirectional, logic-seeking print mode.

Bar codes

The Series 150 Printer supports the ability to print bar codes. The printer will print one of five formats, Interleaved 2 of 5, Code 39, Code 128, UPC A, and EAN-13. The host does not need to form the graphic image for these bar codes. The host need only send the printer the information to be bar coded, and a graphic will be generated. Bar codes can be printed in a high-resolution normal mode or a fast, high-speed mode. The normal mode is more readable than the high speed mode. (See the [ESC][EM]B command on the next page for setting the bar code height and print speed.)

Function	**Print bar code**	
ASCII	[ESC] b <n>{information}[ETX]	
Hexadecimal	1BH 62H <n>... 03H	
Decimal	<27><98><n> ... <3>	
IPCL	&%25 ... [CR]	Interleaved 2 of 5
	&%39 ... [CR]	Code 39
	&%12 ... [CR]	Code 128
	&%UP ... [CR]	UPC A
	&%UE ... [CR]	UPC E
	&%EA .. [CR]	EAN-13
	&%E8 ... [CR]	EAN-8
	&%93 ... [CR]	Code 93
	&%HB<n> ..	Hollerith[10]
EPOS	[ESC] b <n> or [GS] k <n>	

Description This command prints the information as a bar code. The bar code will be centered on the print zone.

Where n			
	0	Interleaved 2 of 5	Numeric (0-9) only; must be an even number of digits
	1	Code 39	26 uppercase letters (A-Z) and 10 digits (0-9)
	2	Code 128	Three sets of 106 different characters
	3	UPC A	Numeric (0-9) only; 11 digits
	4	EAN-13	Numeric (0-9) only; 12 digits
	5	UPC E	Numeric (0-9) only; 11 digits
	6	EAN-8	Numeric (0-9) only; 6 digits
	7	Code 93	26 letters, 10 digits (0-9), and 7 special characters
	10	Hollerith	ASCII data up to 16 digits

Interleaved 2 of 5 This is a high-density, self-checking continuous numeric bar code. It is mainly used where fixed length numeric fields are required. The data field must be an even number of characters. If an odd data field is sent to the Series 150 Printer, it will be zero padded. Due to space limitations, only 16 characters can be printed. (Note: Interleaved 2 of 5 does not read well in fast mode.)

Code 39 This is an alphanumeric bar code. It is a discrete, self-checking, variable length code. The complete data field is printed. Due to space limitations, only eight characters can be printed. If illegal characters are passed to the printer, they will be converted to legal codes, i.e., a → A.

Code 128 This is an alphanumeric bar code. It is a high density, variable length, continuous code that employs multiple element widths. Code 128 has 3 possible start codes. The start code defines the set as Code A, B, or C. The first

[10] The Hollerith bar code is only available on custom configurations.

character in the data field defines the code set, Start Code A = <135>, Code B = <136>, and Code C = <137>. The complete data field is printed by the printer. Due to space limitations, only nine characters can be printed. A check digit is generated by the printer.

Code 128 Note — With Code 128, the "A" space is defined as a <0>. This makes programming difficult and causes control character conflicts for the printer. To help solve these problems in Code 128, the Series 150 Printer subtracts 32 from all characters that are to be included in the bar code. In the Code 128 definition, an "A" is <33>; however, the printer will convert an ASCII "A" (<65>) to a <33> internally. This puts Code 128C and the start codes off by 32.

UPC A — This is a fixed length, numeric, continuous code that employs four element widths. The printer supports Universal Product Code Version A , E, EAN-8, and EAN-13. Version A encodes 11 digits. Typically, the UPC A format starts with a number system digit, five-digit manufacturer's code, five-digit product code, and a check digit. The printer makes no assumptions about any of the codes except the check digit. The printer will print a UPC bar code with the 11 digits sent to it and generate the check digit. If fewer than 11 digits are sent, the remaining digits will be zeroes. The printer will print a UPC that is about 130% the size of the UPC nominal standard which provides optimal readability.

UPC E — This is a zero suppression version of UPC. The printer requires that the first digit is zero for number system zero. If it is not zero, the bar code is not printed. The printer does the compression based on the compression rules for UPC-E. The printer will print a UPC bar code based on the 11 digits sent to it and generate the check digit. If fewer than 11 digits are sent, the remaining digits will be zeroes. The printer will print a UPC that is about 130% the size of the UPC nominal standard which provides optimal readability.

EAN-8 — This is a fixed length, numeric, continuous code that employs four element widths. The printer supports EAN-8 which is a superset of UPC which encodes seven digits. The printer will print an EAN-8 bar code with the seven digits sent to it and generate the check digit. If fewer than seven digits are sent, the remaining digits will be zeroes. The printer will print an EAN-8 bar code that is about 130% the size of the nominal standard which provides optimal readability.

EAN-13 — This is a fixed length, numeric, continuous code that employs four element widths. The printer supports EAN-13 which is a superset of UPC which encodes 12 digits. Typically, the format starts with a number-set digit, which defines how the next six digits are encoded. The next five digits have fixed encoding. The last is a check digit. The printer will print an EAN-13 bar code with the 12 digits sent to it and generate the check digit. If fewer than 12 digits are sent, the remaining digits will be zeroes. The printer will print an EAN-13 bar code that is about 130% the size of the nominal standard which provides optimal readability.

Code 93 — This is an alphanumeric, variable length bar code. The complete data field is printed by the printer. Due to space limitations, only 11 characters can be printed.

Hollerith — This is variable length, ASCII data that is intended for use with optical mark readers. The printer will print a grid of encoded rectangles arranged horizontally across the paper.

Notes

A [CR] may also be used in place of the [ETX] to end the bar code data field.

Only information that is usable in a particular bar code will be printed.

Function **Bar code height**

ASCII [ESC] [EM] B <n>
Hexadecimal 1BH 19H 42H <n>
Decimal <27><25><66> <n>
IPCL &%BH <m_1> <m_2>
EPOS [GS]h<n>

Description This command sets the bar code height where <n> is the number of print passes. Each pass is about 0.11 inch high. If n = <0>, the printer returns to the default values of four passes for all except the UPC which is seven. Any value from 0 to 9 may be specified.

Function **Set bar code justification and human readable number print modes**

ASCII [ESC] [EM] J<n>
Hexadecimal 1BH 19H 4AH <n>
Decimal <27><25><74> <n>
IPCL &%BJ<m_1> <m_2>
EPOS none

The power on default is center justified with numbers on UPC bar codes.

Note: This command only effects bar code printing.

Description This command selects the operation of the bar code justification and number printing.

Where n-bits

n	IPCL	76543210	
		------xx	Justification
0	00	------00	Left
1	01	------01	Center
2	02	------10	Right
		----xx--	Human readable
0	00	----00--	No numbers
4	04	----01--	Numbers on UPC bar codes
8	08	----10--	Numbers on non-UPC bar codes
12	12	----11--	Numbers on all bar codes

Receipt Paper Out Sensor

The paper out sensor in the Series 150 Printer, senses when the paper is exhausted. When the printer generates a paper out fault, the printer stops printing and goes off-line. If the printer is off-line, ENQ's may not be accepted. To prevent the printer from going off-line when paper out is sensed, you can send an [ESC] 8.

Function	**Disable paper out sensor**
ASCII	[ESC] 8
Hexadecimal	1BH 38H
Decimal	<27><56>
IPCL	&%PF
EPOS	none
Description	This command disables paper out sensing and is intended to temporally disable the paper out sensor. The printer will not stop printing or go off-line when paper out is sensed. The [ENQ] commands will still return paper out status.

Function	**Enable paper out sensor**
ASCII	[ESC] 9
Hexadecimal	1BH 39H
Decimal	<27><57>
IPCL	&%PO
EPOS	none
Description	This command enables paper sensing and is intended to reverse the effect of the disabled paper out sensor command. If the printer is out of paper when this command is issued, it will go off-line.

Cutter Operation

Function	**Activate cutter**
ASCII	[ESC] v
Hexadecimal	1BH 76H
Decimal	<27> <118>
IPCL	&%FC Cut
EPOS	[ESC] m or [ESC]I
Description	This command cuts the receipt tape above the current print line. **Note:** This command is only effective on printers with a knife.

Validation Operation

The form is inserted from the top and extends out the left side and/or top of the printer. It rests on a fixed stop. A maximum of 16 lines at 40 characters can be printed on a form. In this manual, top insertion will be termed validation mode.

Function	**Open for validation**
ASCII	[ESC] [DC1]
Hexadecimal	1BH 11H
Decimal	<27><17>
IPCL	&%VO
EPOS	[ESC] c 0 <n>
Description	This command opens the form compensation assembly for validation. No automatic validation form sensing is performed. The application must poll the printer for validation forms present and then issue a close compensation command.

Function	**Close for validation**
ASCII	[ESC] [DC3]
Hexadecimal	1BH 13H
Decimal	<27><19>
IPCL	&%VC
EPOS	[ESC] c 0 <n>
Description	This command closes the form compensation assembly for validation. No automatic validation form sensing is performed.

Function	**Close for validation when form is sensed**
ASCII	[ESC] [DC4]
Hexadecimal	1BH 14H
Decimal	<27><20>
IPCL	&%VS
EPOS	[ESC] c 0 <n>
Description	This command closes the form compensation assembly for automatic validation form sensing by the printer.

Validation Operation Control

The Series 150 Printer has several features that can be altered during operation. For example, the time delay between when a form is sensed and when the form clamp is activated, can be changed. This allows the operation of the printer to be tailored to the application and the form being used.

All feature control commands are extensions of the [ESC][EM] sequence. They are defined as follows.

Function	**Validation clamp delay**
ASCII	[ESC] [EM] C <n>
Hexadecimal	1BH 19H 43H <n>
Decimal	<27><25><67> <n>
IPCL	&%ZC <m_1> <m_2>
EPOS	[ESC] f
Description	This command sets the clamp delay which is the time between when the form is sensed and when it is clamped. (Only the least 4-bits are used.) The default is configurable.
Where <n>	0 = 0 ms 1 = 50 m 2 = 150 ms, and so on until 15 = 750 ms **Note:** Once issued, the value will be used until the printer is power cycled or the command is reissued.

Function	**Set validation time out**
ASCII	[ESC] [EM] V <n>
Hexadecimal	1BH 19H 56H<n>
Decimal	<27><25><86><n>
IPCL	&%ZV <m_1> <m_2>
EPOS	[ESC] f
Description	This command sets the time-out after a top validation command with auto sense is issued and the printer returns to receipt mode. Where <n> is the delay in 1 minute increments; minimum = 1 minute; maximum = 15 minutes. If <n> = 0, the delay is set to no time out (waits forever). The default is configurable.

Function	**Set left/right print margin**
ASCII	[ESC] X <n1> <n2>
Hexadecimal	1BH 58H <n1> <n2>
Decimal	<27><88> <n1> <n2>
IPCL	none
EPOS	[ESC]l, [ESC]Q
Description	Set left and right print margin in characters from the home position.
Where	n1 = Left margin n2 = Right margin The absolute position depends on the current print pitch.

	8 cpi	10 cpi	12 cpi	15 cpi	17.1 cpi	20 cpi	24 cpi
Maximum Columns	18	23	28	35	40	46	56
<n1>	1 to 18	1 to 23	1 to 28	1 to 35	1 to 40	1 to 46	1 to 56
<n2>	<n1>+2 to 18	<n1>+ 2 to 23	<n1>+3 to 28	<n1>+ 3 to 35	<n1>+4 to 40	<n1>+4 to 46	<n1>+4 to 56

If the left and right margins are set to the right of the current horizontal position, the new left and right margins become valid in the same line.

If the left margin is set to the left of the current horizontal position and the right margin to the right of the current horizontal position, the right margin becomes valid in the same line, but the left margin setting becomes valid in the next line.

When the left and right margins are set to the left of the current horizontal position, both left and right margin settings appear to become valid in the next line. This is because an AUTO CR is performed by the following data.

Miscellaneous Control

Function	**Clear print buffer**
ASCII	[CAN]
Hexadecimal	18H
Decimal	<24>
IPCL	&%RP
EPOS	[CAN]
Description	This command clears any unprinted information in the printer received before the [CAN]. If the input buffer is not being processed because the printer is out of paper or the form is not inserted, the CAN command will not be processed until after the error is cleared. The CAN command does not restore default conditions. It only clears the print buffers.

Function	**Open cash drawer**
ASCII	[ESC] x <n>
Hexadecimal	1BH 78H <n>
Decimal	<27><120><n>
IPCL	&%D1 for Cash Drawer 1
IPCL	&%D2 for Cash Drawer 2
EPOS	[ESC] p
Description	This command energizes cash drawer n for 150 ms. Where <n> = <1> (01H) or 1 (31H) for Cash Drawer 1 and <n> = <2> (02H) or 2 (32H) for Cash Drawer 2. The time period the drawer is activated can be changed in the configuration menu. The activation time can be set from 25 ms to 250 ms. **Note:** The open cash drawer commands are processed as part of print data. They are not processed until they are found in the input buffer by the print processor. They are not immediate commands. **Note:** Cash Drawer 2 is factory configurable in one of two modes. Either Pin 2 or 3 is active depending on an internal jumper setting. The factory default is Pin 3. Cash Drawer 1 is always on Pin 2. The cash drawer status is defined as an open circuit for drawer closed.

Function	**Query marker**
ASCII	[ESC] q <n>
Hexadecimal	1BH 71H <n>
Decimal	<27><113>
IPCL	none
EPOS	none

Function **This command returns a status to the host when it is processed.**

	Serial/IEEE1284	Parallel, non-IEEE 1284
Response	[SOH]<n>…	Not supported via PE

Description This command can be placed in the print data and, when processed by the printer, will return a progress status marker. The value of <n> can be any 8-bit value. It is returned to the host unaltered. The intent is for it to be a sequence number. This command can be used to track the print progress of the printer or verify that the data has been printed.

Note: This command is a line terminator and causes the printer to print all previous data. If a normal line terminator (like a [CR]) is not supplied, right justify and auto center will not function correctly. All data will be left justified. [ESC]q does not perform a [CR] or [LF] function.

Function	**Print suppress and data pass through**
ASCII	[ESC] < <n>
Hexadecimal	1BH 3CH <n>
Decimal	<27> <60> <n>
IPCL	&%PT <n>
EPOS	[ESC] = <n>

Description This command provides print suppress and data pass through features.

Where
Bit 0 Printer select
Bit 1 Pass through ON
Bits 2-7 Undefined

If Bit 0 is clear, the printer will stop processing data. If Bit 1 is set, the data will be passed through the printer and sent out on the serial port.

Notes: The pass through command is processed as part of print data. The pass through command is not processed until it is found in the input buffer by the print processor. It is not an immediate command. The printer must be on-line and ready to activate this command.

The operation of this command can be altered by the print suppress configuration.

Function	**Control feature commands**
ASCII	[ESC] y <n>
Hexadecimal	1BH 79H <n>
Decimal	<27><121><n>
IPCL	&%Y0 through 8
EPOS	[ESC]y<n>

Where n
0 Disables quiet mode operation
1 Enables quiet mode operation
2 Reinitializes the printer and forces IBM mode
3 Reinitializes the printer and forces EPOS mode
4 Disables IPCL commands
5 Enables IPCL commands
Note: Once disabled, this command will not be a valid IPCL code.
8 Enables extended diagnostics

Description This command enables and disables command set features.

It is possible that the IPCL commands will interfere with print data. If this is the case, they can be disabled with an [ESC] y <4>.

Notes: Quiet mode operation prints by making two passes for every pass in normal mode. It generates less noise because only half the print wires are activated in each pass. This mode is very slow and should only be used if quiet operation is needed.

ESC y <2> and <3> allow the printer to switch between Normal and EPOS modes. When the switch takes place, the current print buffer is printed and the printer reinitializes. These commands do not permanently change the configuration. A power on reset will restore the mode that was configured in menu mode. A reset by command or from the INIT pin will not restore the mode.

EPOS Note: This command is active in EPOS mode; however, mode 5 is disabled.

Function	**Enable Dynamic Response**
ASCII	[ESC] w <n>
Hexadecimal	1BH 77H <n>
Decimal	<27><119><n>
IPCL	none
EPOS	[GS]a<n>

Where n defines the features that cause dynamic responses.

Bit 0	Cash Drawer 0	ACK/NAK <1>
Bit 1	Cash Drawer 1	ACK/NAK <2>
Bit 2	Paper out status	ACK/NAK <4>
Bit 3	Form in sensor	ACK/NAK <5>
Bit 6	Form clamp status	ACK/NAK <7>

Dynamic status can be used to allow the host to sense status changes without sending repeated ENQ commands. The operation of the dynamic response varies depending on the configuration of the printer. If the printer is configured for Serial or IEEE 1284 operation, more than one status can be sensed as the printer will respond to status changes as if an [ENQ] were issued. In parallel mode, only one status should be requested. If more than one bit is active, the result status on the PE signal is not defined.

Note: Power up default is paper out on PE signal.

Printer Status Set/Inquire

The Series 150 Printer is designed to be used as part of an automated system where the host computer makes every attempt to correct problems with the printer. In addition, the host application requires that it be able to obtain more information from the printer than is typical of normal computer printers. A normal computer printer does not have cash drawers and validation to deal with. As a result, the standard printer protocol must be extended to deal with the additional features of a POS printer.

The Series 150 Printer has defined a set of status inquiry commands that will allow a host to obtain information about the printer and devices connected to it. The method chosen to interact with the computer is designed to allow a reasonable approach to the host application. It will not always be possible for an existing application to use the ENQ commands unless the communication drivers are available to the programmer.

All ENQ commands require a response from the printer. For this reason, the parallel, non-IEEE 1284; IEEE 1284; and serial operation of ENQ commands are different. In serial and parallel, IEEE 1284 modes, all ENQ commands are responded to by ACK or NAK and then the command ID. In parallel non-IEEE 1284 operation, the paper error (PE) signal is driven as a response to an ENQ.

Parallel, Non-IEEE 1284 Mode Inquire

There are several status inquiry commands and ENQ control commands. The ENQ character is treated differently from all other characters received by the printer. Under normal operating conditions, all information that is sent to the printer is received and placed in a holding buffer. The information stays in the holding buffer until the printer prints or interprets it.

The inquire command in non-IEEE 1284 mode presents a few problems for the printer to decode. In parallel mode, the ENQ character is intercepted before it is placed in the print buffer. The next character is looked at to determine if this might be a valid ENQ command. If it might be valid or in graphics, further input is then blocked by not removing the busy status. The buffer is then emptied by the printer during normal operation. If the inquire was false, the command decoder will process a command. If an [ENQ] is found in the data stream at this time, input is unblocked and normal operation is resumed. The printer is unaffected by this unintended operation except that the buffer efficiency is reduced. If the inquire was real, the [ENQ] is processed. This ensures that the response to the inquire is synchronized with the inquire request and that no false inquires are processed.

In parallel, non-IEEE 1284 operation, there is no easy way to return complex information to the host. For this reason, the PE signal is used for inquire responses. The fault signal will not be asserted by inquire requests. If a true PE is being signaled, the fault line will also be driven. It is, therefore, possible to distinguish between a paper error and an ENQ response.

In parallel mode, the printer will respond to the ENQ before the parallel sequence is complete. In other words, when the parallel port acknowledges the ID part of the ENQ sequence, the PE signal will be valid. The host must, however, remember what status was requested as the printer has no way of signaling that information. In addition, the host must not interpret the PE signal as an error but as a response to an ENQ. There are two ways in which inquire responses can be signaled. The PE can be static or dynamic. When a dynamic PE occurs, the inquiry is sent once, and the PE signal follows the requested status. If the PE remains static, the status will not change.

Receipt paper status is always dynamic. If the PE signal is to be returned to the valid paper error state, an [ENQ]<4> should be issued when all other inquires are completed.

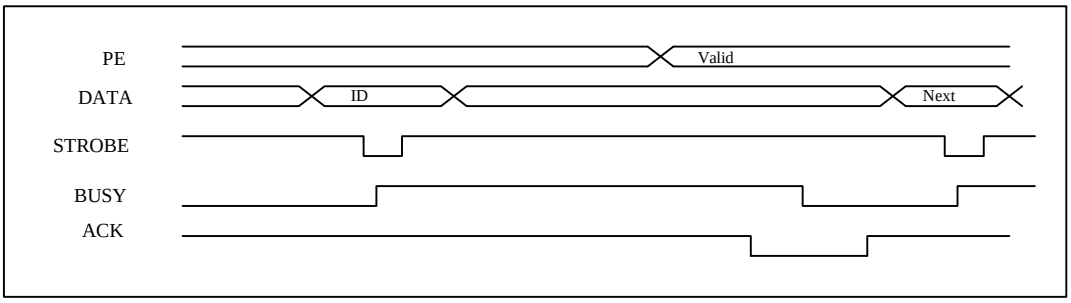


Figure 13 PE to ENQ request timing

Serial Mode Inquire

In serial mode, inquires are not handled any differently than other commands. All ENQ commands require a response from the printer and are responded to by ACK or NAK and then the command ID.

The serial ACK or NAK responses are always uniform and followed with a command ID. This makes the design of the host application easier because the response can be identified and the same format is always followed.

The printer will always accept serial data. If the printer is off-line, the serial data is still accepted. It is possible to send inquire commands to the printer even if it is off-line. Because ENQ commands are processed before they go in the buffer, the printer will respond even when it is busy printing.

In serial mode, it is desirable that the response to an ENQ be received by the host before another ENQ command is issued to the printer. When the printer receives an ENQ, it must generate a response. If ENQ's are sent to the printer too fast, the printer could overrun its output buffer.

Parallel, IEEE 1284 Mode Inquire

In parallel, IEEE 1284 mode, there is a way to return status information to the host. After the host makes an ENQ request, the host can activate parallel, IEEE 1284 Mode 0 reverse channel and wait for a response from the printer. The response to the ENQ is identical to serial mode.

The printer will always accept IEEE 1284 reverse channel requests but will not accept ENQ commands when off-line. It is possible to obtain status when off-line by placing the printer in dynamic response mode before the printer goes off-line. The IEEE 1284 reverse channel will then respond to status changes even if the printer is off-line.

Dynamic Response Mode

Dynamic status, [ESC] w <n>, can be used to allow the host to sense status changes without sending repeat ENQ commands. The operation of the dynamic response varies depending on the configuration of the printer. If the printer is configured for serial or parallel, IEEE 1284 operation, more than one status can be sensed as the printer will respond to status changes as if an [ENQ] were issued. In parallel mode, only one status should be requested. If more than one-bit is active, the resulting status on the PE signal will not be defined. The reply to dynamic responses

is the same as that for inquire commands. That is, if the cash drawer status is to be sensed, the PE or ACK/NAK will be the same as for inquire commands.

Inquire Commands

The ENQ commands are as follows.

Function	**Inquire printer status**
ASCII	[ENQ] <n>
Hexadecimal	05H <n>
Decimal	<5><n>
IPCL	none
EPOS	[GS] r or [DLE] [ENQ] or [DLE] [EOT]
Description	This command inquires as to the printer's status and returns the result. The following ENQ's are defined. **Note:** If the printer is off-line, ENQ's may not be accepted.

Function	**Inquire Cash Drawer 1 status**
ASCII	[ENQ] <1>
Hexadecimal	05H 01H
Decimal	<5><1>

Function	**Cash Drawer 1 status**	
	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <1> (06H 01H) Cash Drawer 1 is closed.	PE low
	NAK <1> (15H 01H) Cash Drawer 1 is open.	PE high
	The cash drawer status is defined as open circuit being drawer closed.	

Function	**Inquire Cash Drawer 2 status**
ASCII	[ENQ] <2>
Hexadecimal	05H 02H
Decimal	<5><2>

Function	**Cash Drawer 2 status**	
	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <2> (06H 02H) Cash Drawer 2 is closed.	PE low
	NAK <2> (15H 02H) Cash Drawer 2 is open.	PE high
	The cash drawer status is defined as open circuit being drawer closed.	

Function	**Inquire receipt-paper out**
ASCII	[ENQ] <4>
Hexadecimal	05H 04H
Decimal	<5><4>

Function	**Receipt-paper out**	
	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <4> (06H 04H) There is receipt paper.	PE low
	NAK <4> (15H 04H)	PE high

The receipt paper is exhausted.

Function **Inquire form position sensor status**

ASCII [ENQ] <6>
Hexadecimal 05H 06H
Decimal <5><6>

Function **Is the form position sensor detecting a form?**

	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <6> (06H 06H) The position sensor is clear. (No form present.)	PE low
	NAK <6> (15H 06H) The form position sensor is blocked. (There is a form.)	PE high

Function **Inquire form-clamp status**

ASCII [ENQ] <7>
Hexadecimal 05H 07H
Decimal <5><7>

Function **Inquire whether the form clamp is closed**

	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <7> (06H 07H) The clamp is closed.	PE low
	NAK <7> (15H 07H) The clamp is not closed. (It is open or in jam position.)	PE high

Function **Is the buffer empty? Clear IEEE 1284 buffer.**

ASCII [ENQ] <9>
Hexadecimal 05H 09H
Decimal <5><9>

Function **This command allows the host to know when the print buffer is empty. If IEEE 1284 is active, this command also clears the response buffer.**

	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <9> (06H 09H) The buffer is empty.	PE low
	NAK <9> (15H 09H) The buffer is not empty.	PE high

Function	**Request printer reset**
ASCII	[ENQ] <10>
Hexadecimal	05H 0AH
Decimal	<5><10>

Function	**Reset printer**	
	Serial	Parallel mode
Response	ACK <10> (06H 0AH) The command was accepted. NAK <10> (15H 0AH) The command was rejected.	No response in parallel mode.
Description	This command is similar to asking for a power on reset except no internal diagnostics are run. The internal print buffer will be cleared. The printer will be ready to except new information when the ACK response is sent. In parallel mode, the INIT signal should be used. This command will be rejected. (In Serial/Parallel mode, the command will also be rejected).	

Function	**Inquire power-cycle status**
ASCII	[ENQ] <11>
Hexadecimal	05H 0BH
Decimal	<5><11>

Function	**Has the printer been power cycled since the last request?**	
	Serial/Parallel, IEEE 1284	Parallel, non-IEEE 1284
Response	ACK <11> (06H 0BH) Printer power has been cycled since last [ENQ] <11>.	PE low
	NAK <5> (15H 0BH) Printer has not power cycled since last [ENQ] <11>.	PE high
Description	The first time after a reset this command will return [ACK] <11>, after that the command will return [NAK] <11>. This command allows the application to determine if the printer has been power cycled and needs to be reinitialized. The [ENQ] <10> command and the INIT signal on the parallel port will both cause the printer to return power up status.	

Function	**Inquire printer state**
ASCII	[ENQ]<15>
Hexadecimal	05H 0FH
Decimal	<5><15>

Function	**Returns current printer state**	
	Serial/Parallel, IEEE1284	Parallel, non-IEEE 1284
Response	[ACK]<15><n><r1><r2>…	Not supported via PE

Where <15> is the echo of command ID.

n = number of return bytes + 40 (to prevent confusion with XON/XOFF).

<r1>: Bit 0 = Form clamp closed
Bit 1 = Undefined
Bit 2 = Receipt paper out
Bit 3 = Undefined
Bit 4 = In error state (Waiting for error to be cleared)
Bit 5 = Undefined
Bit 6 = 1 always
Bit 7 = 0 always

<r2>: Forms processing state

040H No forms processing

044H Waiting to enter validation mode or for the paper path to be cleared to enter validation mode

045H Waiting for an internal delay time out (auto clear)

Other states may be active but will automatically be cleared.

Function	**Inquire all printer status**
ASCII	[ENQ]<20>
Hexadecimal	05H 14H
Decimal	<5><20>

Function	**Returns all status flags**	
	Serial/Parallel, IEEE1284	Parallel, non-IEEE 1284
Response	[ACK]<20><n><r1><r2>…	Not supported via PE

Where <20> is echo of command ID.

n = number of return bytes + 40 (to prevent confusion with XON/XOFF).

<r1>: Bit 0 = Cash Drawer 1 open
Bit 1 = Cash Drawer 2 open
Bit 2 = Receipt paper out
Bit 3 = Undefined
Bit 4 = Undefined
Bit 5 = Form sensor detects paper
Bit 6 = 1 always
Bit 7 = 0 always

<r2>: Bit 0 = Form clamp closed
Bit 1 = Undefined
Bit 2 = Buffer empty
Bit 3 = Printer power cycled (does not affect state of power cycled flag) Use [ENQ]<11> to reset.
Bit 4 = Printer waiting in error mode
Bit 5 = Undefined
Bit 6 = 1 always
Bit 7 = 0 always

<r3>: Bit 0 = Receipt station selected
Bit 1 = Top validation station selected
Bit 2 = Undefined
Bit 3 = Waiting for form
Bit 4 = Undefined
Bit 5 = Printer blocking print (Out of paper)
Bit 6 = 1 always
Bit 7 = 0 always

<r4>: Bit 0 = Printer supports receipt
Bit 1 = Printer supports inserted forms
Bit 2 = Undefined
Bit 3 = Printer supports cutter

Function	**Inquire printer ID**
ASCII	[ENQ]<21>
Hexadecimal	05H 15H
Decimal	<5><21>

Function	**Returns printer IEEE 1284 ID string**	
	Serial/Parallel, IEEE1284	Parallel, non-IEEE 1284
Response	[ACK]<21><n>{ID string}	Not supported via PE

Where <21> is echo of command ID.
<n> = number of return bytes in the ID string

{ID string} is the IEEE ID return string which is as follows:
MFG:Ithaca-Periph.;
CMD:M150CL,IPCL;
CLS:PRINTER;
MDL:S150 PcOS;
DES:Ithaca-Peripherals Series 150;
REV:01.00;
OPTS:$51xy
Where x is a bit field defined as follows:
Bit 0 = Alternate print zone
Bit 1 = 0 not defined
Bit 2 = 0 not defined
Bit 3 = Always 0
Bit 4 = Always 1
Bit 5 = Always 1
Bit 6 = Always 0
Bit 7 = Always 0
and y is a bit field defined as follows:
Bit 0 = Slip capability
Bit 1 = Knife installed
Bit 2 = MICR installed
Bit 3 = Always 0
Bit 4 = Always 1
Bit 5 = Always 1
Bit 6 = Always 0
Bit 7 = Always 0

Extended Diagnostic Commands

Function	**Extended diagnostics**	
ASCII	[ESC] ~ <n>	
Hexadecimal	1BH 7EH	
Decimal	<27><126>	
IPCL	none	
EPOS	[ESC]~<n>	
Where n	0	Prints model, configuration, and serial number
	1 <n>	Sets vertical alignment
	Where <n> is the alignment value **Note:** n will be written to the EEPROM if the EEPROM save sequence is processed.	
	2	Decreases vertical alignment adjustment
	3	Increases vertical alignment adjustment
	4	Prints a vertical adjustment alignment chart
	[ACK]	Returns a configuration synchronization code
	C <a><d>	Changes EEPROM data at <a> to <d> (pass code locked)
	D	Returns menu to default (pass code locked)
	I	Returns ROM ID
	P	Forces IEEE 1284 mode (This does not alter menu RAM.)
	R	Reads and returns the menu RAM
	S	Forces serial mode (This does not alter menu RAM.)
	T	Clears the totals (pass code locked)
	W	Writes menu RAM back to EEPROM (pass code locked)
	Z	Halts the software
	[CAN]	Forces the printer to power cycle
Description	These commands are designed to be used by the factory to help adjust and test the printer. There is no guarantee that these commands are valid and/or stable. They are not intended for use by the end user. To prevent accidental use of these commands, they must be enabled by an [ESC]y<8> command. In some cases, a pass code sequence is also required.	
Write EEPROM	This command allows specific Menu RAM locations to be written. The definition of the locations is not defined here. This command is intended for use by the factory and is only active if a pass code is sent to the printer.	

EPOS Codes

This section lists the EPOS codes that are supported by the Series 150 Printer. Ithaca Peripherals has no control over of how Epson extends or changes these control codes. Ithaca Peripherals makes no guarantees as to the operation of its printer when it replaces an Epson printer. The EPOS emulation is intended to make it as easy as possible to replace an Epson printer with an Ithaca Series 150 Printer.

The following section lists all EPOS commands that are processed. They are as close as possible to Epson printers. The user must remember that the Series 150 Printer is not designed as a drop-in replacement for an Epson printer. The Series 150 Printer is designed to bring new and unique features and functionalities to a POS receipt/validation printer.

Real-time Status

The Series 150 Printer is available in serial and parallel versions. When Epson supports parallel operation, the company redefines some of the standard IEEE 1284 interface signals to be special status lines. The Series 150 Printer does not alter the IEEE 1284 standard. If an application requires real-time status from the printer, the IEEE 1284 bidirectional protocol must be used.

The Series 150 Printer supports real-time status. The EPOS real-time status commands [DLE] [ENQ] and [DLE] [EOT] are processed by the printer. The printer, however, does not support all the response bit fields. See the descriptions below.

EPOS Command Summary

Please refer to the Epson ESC/POS Information Manual for field definitions.

The following is a list of the EPOS commands that are supported.

Command	Comment	Description
[BEL]	Extension	Activate sound buzzer.
[VT]	Extension	Set vertical tabs.
[LF]		Set line feed.
[FF]		Eject form.
[HT]	Extension	Set horizontal tabs.
[BS]	Extension	
[CR]		Set carriage returns.
[CAN]	Not the same	Cancel print (not the same as Epson).
[ESC][BEL]	Extension	Activate sound buzzer.
[ESC] SI	Extension	Set 24 cpi.
[ESC][SP] <n>		Set right-side character spacing.
[ESC] ! <n>		Select print modes.
[ESC] $ <nl> <nh>		Set absolute print position.
[ESC] % <n>	Not implemented	Select or cancel the user defined character set.
[ESC] & ...	Not implemented	Define user defined characters.
[ESC] * <m> <n>1 <n>2	Extension	Select single-density bit image mode.
[ESC] - <n>		Turn underline mode ON/OFF.
[ESC] 0		Set 8 lines per inch spacing.
[ESC] 1		Set 7/72-inch spacing.
[ESC] 2		Set 6 lines per inch spacing.
[ESC] 3 <n>		Set line spacing.
[ESC] 4	Extension	Set italic mode set.
[ESC] 5	Extension	Set italic mode reset.

[ESC] <		Return home (not needed with the Series 150 printer).
[ESC] =	Not the same	Select peripheral device (Pass through).
[ESC] ?	Ignored	Cancel user defined characters.
[ESC] @		Initialize printer.
[ESC] B <n>1 <n>2 <n>3 ... <n>i 0	Extension	Set vertical tab stops.
[ESC] C <n>	Similar	Set form length.
[ESC] D <n>1 <n>2 <n>3 ... <n>i 0	Extension	Set horizontal tab stops.
[ESC] E <n>		Turn emphasize ON/OFF.
[ESC] G <n>		Turn double-strike mode ON/OFF.
[ESC] J <n>		Print and feed.
[ESC] K <n>	Not implemented	Print and reverse feed.
[ESC] M <n>		Select character font.
[ESC] Q <n>		Set right margin in characters.
[ESC] R <n>		Select International Character Set.
[ESC] U <n>		Turn unidirectional mode ON/OFF.
[ESC] V <n>	Similar	Turn 90° clockwise mode ON/OFF.
[ESC] [<m><n>		Select code page/print features (same as normal mode).
[ESC] \ <nL> <nH>		Set relative print position.
[ESC] ^ ...		Set Epson 9-pin bit image.
[ESC] a <n>		Set left, center, or right justify.
[ESC] b <n>		Print bar code (same as normal mode).
[ESC] c <n>		Select station (similar to Epson). See description below.
[ESC] d <n>		Feed <n> lines.
[ESC] e <n>	Not implemented	Print and reverse feed.
[ESC] f <t1> <t2>	Similar	Set wait time (similar to Epson). See description below.
[ESC] I		Set full cut.
[ESC] l <n>		Set left margin in characters.*
[ESC] m		Set partial cut.
[ESC] p <m> <t1> <t2>	Similar	Generate pulse (similar to Epson). See description.
[ESC] q		Release form.
[ESC] t <n>		Select Character Code Table (may vary from Epson Select Code).
[ESC] u <n>		Return status of cash drawer (Serial and IEEE 1284 only).
[ESC] v	Extension	Return null byte to host.
[ESC] x <n>	Extension	Set print font (same as Normal [ESC]I <n>).
[ESC] { <n>		Turn upside down print ON/OFF.
[ESC] ~ <n>	Extension	Test mode diagnostic commands.
[GS] !		Select character size.
[GS] I <n>		Transmit specified ID (different than Epson).
[GS] L ...		Set left margin in 1/160 inch.
[GS] W ...		Select printable area in 1/160 inch.
[GS] h <n>	Extension	Set bar code height.
[GS] k <m> ... <0>	Extension	Print bar code.

EPOS Deviations

There are several important differences between the M150 and EPSON printers. The closest EPSON printer to the M150 is the TM-U325. An application that was written for the EPSON printer may require some modification to use the M150.

Command Descriptions

Function	**Activate buzzer**
ASCII	[BEL] or [ESC][BEL]
Description	This command activates the sound buzzer. **Note:** This command only functions if the internal buzzer option was installed at the factory.

Function	**Eject form**
ASCII	[FF]
Description	The M150 Printer does not support page mode. The printer will eject a form.

Function	**Cancel print data**
ASCII	[CAN]
Description	The M150 Printer uses [CAN] to clear the printer line buffer.

Function	**Return home**
ASCII	[ESC] <
Description	The M150 Printer does not need this command. The M150 Printer never loses track of the print head. The effect of this command is to set the next print line to print from left to right.

Function	**Select peripheral device**
ASCII	[ESC] = <n>
Description	The M150 Printer does not support the Epson Pole Display. This command provides print suppress and data pass through functions.
Where	Bit 0 Printer select Bit 1 Pass through Bits 2-7 Undefined

Function	**Set form length**
ASCII	[ESC] C <n>
Description	The M150 Printer uses this command to set the form length.

Function **Set print direction**

ASCII [ESC] T <n>

Description The M150 Printer does not implement page mode. This command uses the normal rotated print format procedures. See [ESC] r <n> in normal mode.

Note: EPOS reverses Modes 1 and 3.

Function **Print graphics**

ASCII [ESC] * <m> ...

Description The M150 Printer defines the extended graphic modes. Mode 4 is normally 80 dpi. The M150 Printer does not support 80 dpi. If Mode 4 is selected, 72 dpi will be used.

Function **Turn 90° clockwise font ON/OFF**

ASCII [ESC] V <n>

Description The M150 Printer uses the rotated 90° font to implement this command. If 1 dot spacing is selected, 10 cpi is used. If 1.5 dot spacing is selected, 8 cpi is used.

Function **Select print paper**

ASCII [ESC] c 0 <n>

Description The M150 Printer uses this command to select a print station. The M150 Printer does not keep track of different settings for each mode. If a specific print mode is required, it must be respecified.

Function **Select print paper for setting**

ASCII [ESC] c 1 <n>

Description The M150 Printer does not keep track of different settings for each mode. If a specific print mode is required, it must be respecified.

Function **Select detectors to stop printing**

ASCII [ESC] c 4 <n>

Description The M150 Printer does not stop at the end of forms. The application must keep track of the form length.

Function **Enable/disable panel buttons**

ASCII [ESC] c 5 <n>

Description The M150 Printer does not allow the front panel to be disabled.

Function **Enable/disable on-line switch**

ASCII [ESC] c 6 <n>

Description The M150 Printer ignores this command.

Function **Generate pulse**

ASCII [ESC] p <m> <t1> <t2>

Description The M150 Printer does not allow the cash drawer pulse to be altered under software control. The <t1> <t2> parameters are ignored. <m> selects Drawer 1 or 2.

Function **Set impact energy**

ASCII [GS] E <n>

Description The M150 Printer allows higher impact energy in validation modes only.

Function **Set bar code height**

ASCII [GS] h <n>

Description This command sets the bar code height in dot lines. The Series 150 Printer prints bar codes in 8 dot passes in graphics. The height used in EPOS is intended for thermal printers. To allow some type of compatibility between EPOS and the Series 150 Printer, the value of n is divided by 28. This allows a similar size bar code to be printed.

Note: Values less than 28 return the printer to the default values defined by the [ESC][EM]B command in normal mode.

Function **Set bar code**

ASCII [GS] k <m> {information} [NUL]

Description The Series 150 Printer uses the same print functions to print EPOS bar codes as the normal mode bar codes.

EPOS has two formats for bar codes. One is [NUL] terminated; the other has a length field. If <m> is greater than 64, the next byte sets the length in bytes. Only the [NUL] terminated command is supported by the Series 150 Printer.

Where m

0	UPC A	Numeric (0-9) only, 11 digits maximum
1	UPC E	Numeric (0-9) only, 11 digits maximum
2	EAN-13	Numeric (0-9) only, 12 digits maximum
3	EAN-8	Numeric (0-9) only, 6 digits maximum
4	Code 39	26 uppercase letters (A-Z) and 10 digits (0-9)
5	Interleaved 2 of 5	Numeric (0-9) only, must be even number of digits

Note: If Code 128 is to be printed, it must be printed with the [ESC] b <n> command as described on page 48.

MICROLINE Codes

This section lists the MICROLINE codes that are supported by the PcOS Series 150 Printer. Ithaca Peripherals has no control over of how Okidata extends or changes these control codes. Ithaca Peripherals makes no guarantees as to the operation of its printer when it replaces an Okidata printer. The MICROLINE emulation is intended to make it as easy as possible to replace an Okidata printer with a Series 150 Printer.

The following section lists all MICROLINE commands that are processed. They are as close as possible to Okidata printers. The user must remember that the Series 150 Printer is not designed as a drop-in replacement for an Okidata printer. The PcOS Series 150 Printer is designed to bring new and unique features and functionalities to a POS receipt/validation printer.

MICROLINE Command Summary

Please refer to the Okidata MICROLINE Information Manual for field definitions.

The following is a list of the MICROLINE commands that are supported.

Command	Description
[VT]	Set vertical tabs.
[LF]	Set line feed.
[FF]	Set form feed.
[HT]	Set horizontal tab.
[BELL]	Open Cash Drawer 1.
[BS]	Open Cash Drawer 2.
[CR]	Set carriage returns.
[CAN]	Clear print buffer.
[EM]	Set full cut.
[SUB]	Set partial cut.
[ESC]	Begin escape sequence.
[FS]	Set 12 cpi.
[GS]	Set 17 cpi.
[RS]	Set 10 cpi.
[US]	Start double-wide print.
[ESC] HT <n>1 <n>2 <n>3 ... <n>i 0	Set horizontal tabs. (Sets tabs at columns n^1 n^2 ... n^k 0)
[ESC] [DC1]	Set open for validation.
[ESC] [DC3]	Set close for validation.
[ESC] [DC4]	Select validation mode with auto form sense.
[ESC] ! /	Begin italics (Utility 10/12 cpi mode only).
[ESC] ! *	End italics.
[ESC] # 0	Select HSD Mode.
[ESC] % 5 <n>	Perform fine line feed.
[ESC] % 9 <n>	Set fine line spacing.
[ESC] +	Open Cash Drawer 1.
[ESC] -	Select unidirection print.

Command	Description
[ESC] 0	Select Utility Print Mode.
[ESC] 1	Select NLQ Mode.
[ESC] 6	Set 6 lines per inch.
[ESC] 8	Set 8 lines per inch.
[ESC] C	Start underline.
[ESC] D	Stop underline.
[ESC] J	Start superscript.
[ESC] M	Stop superscript.
[ESC] N	Start subscript.
[ESC] M	Stop subscript.
[ESC] T	Begin emphasized print (half speed).
[ESC] H	Begin enhanced print (double pass).
[ESC] I	End emphasized/enhanced print.
[ESC] K <n>[1] <n>[2]	Set single-density graphics. n1=0..255 n2=0..3 len=n1 +256*n2
[ESC] L <n>[1] <n>[2]	Set double-density half-speed graphics. n1=0..255 n2=0..3 len=n1 +256*n2
[ESC] Y <n>[1] <n>[2]	Set double-density full-speed graphics. n1=0..255 n2=0..3 len=n1 +256*n2
[ESC] Z <n>[1] <n>[2]	Set quad-density full-speed graphics. n1=0..255 n2=0..3 len=n1 +256*n2
[ESC] r <n>	Set rotated print. n=0 end n=2 upside down
N/A	Print bar code. Interleave 2 of 5 Code 39 Code 128
	Communication Echo Mode **(Serial interface only)**
[ESC] #	Turn on Echo Mode.
[ESC] d	Turn on Alternate Echo Mode.
[ESC] “	Turn off Echo Mode.
[ESC] RS	Turn off alternate Echo Mode.

STAR Codes

This section lists the STAR codes that are supported by the PcOS Series 150 Printer. Ithaca Peripherals has no control over of how Star extends or changes these control codes. Ithaca Peripherals makes no guarantees as to the operation of its printer when it replaces a Star printer. The STAR Emulation is intended to make it as easy as possible to replace a Star printer with a PcOS Series 150 Printer.

The following section lists all STAR commands that are processed. They are as close as possible to a Star printer. The user must remember that the Series 150 Printer is not designed as a drop in replacement for a Star printer. The PcOS Series 150 Printer is designed to bring new and unique features and functionalities to a POS receipt/validation printer.

STAR Command Summary

Please refer to the Star Information Manual for field definitions.

The following is a list of the STAR commands that are supported.

Command	Description
Control codes used in character setting	
[ESC] M	Select 15-cpi character size.
[ESC] P	Select 12-cpi character size.
[ESC] :	Select 8-cpi character size.
[SO]	Select expanded character mode.
[DC4]	Cancel expanded character mode.
[ESC] E	Select emphasized print mode.
[ESC] F	Cancel emphasized print mode.
[ESC] – 1	Select underline mode.
[ESC] – 0	Cancel underline mode.
[ESC] _ 1	Select overline mode.
[ESC] _ 0	Cancel overline mode.
[SI]	Select inverted print mode.
[DC2]	Cancel inverted print mode.
Control codes used in line spacing	
[LF]	Set line feed.
[CR]	Set carriage return.
[ESC] z 1	Set 1/6-inch line feed.
[ESC] 0	Set 1/8-inch line feed.
[ESC] a <n>	Feed paper n lines.
Control codes used for page layout	
[FF]	Set form feed.
[ESC] C <n>	Set page length at n lines.
[ESC] C <0> <n>	Set page length at n inches.
[VT]	Set vertical tabs.
[ESC] B <n1> <n2>	Set vertical tab positions.
[ESC] l <n>	Set left margin.

[ESC] Q <n>	Set right margin.

Command	Description
[HT]	Set horizontal tabs.
[ESC] D <n1> <n2>	Set horizontal tab positions.
Control codes used for graphic printing	
[ESC] 1	Set 7/72-inch line feed.
[ESC] A	Define n/72-inch line feed.
[ESC] 2	Set n/72-inch line feed.
[ESC] J <n>	Set one-time line feed of n/72-inch.
[ESC] z 0	Set 1/12-inch line feed.
[ESC] K <n1> <0>	Set 8-dot single-density bit image.
[ESC] L <n1> <n2>	Set 8-dot double-density bit image.
[ESC] h 1	Select vertical expanded character mode.
[ESC] h 0	Cancel vertical expanded character mode.
Control codes used for peripheral units	
[BEL]	Defer drive command for Peripheral Unit 1.
[EM]	Set immediate drive command for Peripheral Unit 2.
[FS]	Set immediate drive command for Peripheral Unit 1.
[SUB]	Set immediate drive command for Peripheral Unit 2.
Other control codes	
[RS]	Activate sound buzzer. [11]
[CAN]	Cancel print data in buffer.
[ESC] U 1	Select unidirectional print mode.
[ESC] U 0	Select bidirectional print mode.
[ESC] @	Initialize printer.
[ESC] ! *	End italics.
[ENQ]	Perform inquiry.
[ESC] d 0	Cycle auto cutter.[12]
[ESC] d 1	Cycle auto cutter.
[ESC] W 1	Select expanded character mode.
[ESC] W 0	Cancel expanded character mode.
[ESC] y <n>	Set n/144-inch line feed.
[ESC] 3 <n>	Set n/216-inch line feed.

[11] This command only functions if the internal buzzer option was installed at the factory.

[12] The printer can be equipped with either a full or partial cutter option.

NCR2567 Codes

This section lists the NCR codes that are supported by the PcOS Series 150 Printer. Ithaca Peripherals has no control over of how NCR extends or changes these control codes. Ithaca Peripherals makes no guarantees as to the operation of its printer when it replaces an NCR printer. The NCR Emulation is intended to make it as easy as possible to replace an NCR printer with a Series 150 Printer.

The following section lists all NCR commands that are processed. They are as close as possible to NCR printers. The user must remember that the Series 150 Printer is not designed as a drop-in replacement for an NCR printer. The PcOS Series 150 Printer is designed to bring new and unique features and functionalities to a POS receipt/validation printer.

NCR Command Summary

Please refer to the NCR Information Manual for field definitions.

The following is a list of the NCR commands that are supported.

Command	Description
[ENQ]	Send status byte to host.
[BEL]	Open Cash Drawer 1.
[BS]	Open Cash Drawer 1.
[LF]	Set line feed.
[FF]	Advance form one line.
[SO]	Set one-line double-wide.
[SI]	Cancel double-wide command.
[DLE]	Clear all printer and interface functions.
[DC1]	Deactivate all option drivers.
[DC2]	Set one-line double-wide alternate command.
[DC3]	Cancel double-wide alternate command.
[DC4] n	Set paper feed n lines.
[NAK] n	Feed n dot rows after each print line.
[SYN] n	Set number of dot rows fed after each print line.
[ETB]	Print buffer contents; advance one line.
[CAN]	Perform validation open assembly.
[EM]	Perform knife cut.
[SUB]	Perform knife cut.
[GS]	Close platen when form is present.
[RS]	Close platen when form is present.

Control Codes Summary by Code

Normal ASCII	Second ASCII field	Hex Code	IPCL equivalent code	Description	Page
[NUL]		00		Null	
[ENQ]	<n>	05H		Set inquire status. (Refer to command descriptions.)	64
[BS]		08H	&%BS	Set backspace.	16
[HT]		09H	&%HT	Set horizontal tabs.	16
[LF]		0AH	&%LF	Set line feed.	15
[VT]		0BH	&%VT	Set vertical tabs.	20
[FF]		0CH	&%FF	Set form feed.	20
[CR]		0DH	&%CR	Set carriage return.	15
[SO]4		0EH	&%MW	Se one-line double-wide print.	32
[SI]		0FH	&%F1	Set 17 cpi.	30
[DC2]		12H	&%F3	Set 10 cpi.	30
[DC4]		14H	&%MN	Cancel one-line double-wide print.	32
[CAN]		18H	&%RP	Clear print buffer.	57
[ESC]		1BH	&%	Begin escape sequence.	
[SP]2		20H		Space characters.	
<32>... <255>		20H-0FFH		Set printable characters.	
[ESC]	[SI]	1BH,0FH	&%F4	Set 24 cpi.	30
[ESC]	[DC1]	1BH,11H	&%VO	Open for validation.	54
[ESC]	[DC3]	1BH,13H	&%VC	Close for validation.	54
[ESC]	[DC4]	1BH,14H	&%VS	Select validation mode with auto form sense.	54
[ESC]	[EM] B <n>	1BH,19H, 42H	&%BH <m^1>	Set bar code height. n=0 Restore defaults n=1-9 Number of passes (0.11” per pass)	51
[ESC]	[EM] C <n>	1BH,19H, 43H	&%ZC <m^1><m^2>	Set validation clamp delay.	55
[ESC]	[EM] J <n>	1BH,19H, 4AH	&%BJ <m^1><m^2>	Set bar code justification.	51
[ESC]	[EM] V <n>	1BH,19H, 56H	&%ZV<m^1><m^2>	Set validation time out.	55
[ESC]	# 0	1BH,23H, 30H	&%QT	Set Normal Print Mode. (HSD is normal.)	22
[ESC]	$	1BH,24H		Copy ROM character set to RAM character set.	27
[ESC]	% G	1BH,25H, 47H	&%MI	Begin italics.	37
[ESC]	% H	1BH,25H, 48H	&%CI	End italics.	37
[ESC]	* <m><n>^{1} <n>^{2}	1BH,2AH		Print Epson 9-pin graphics in mode <m>.	46
[ESC]	! <n>	1BH,21H	&%SI <m^1><m^2> <m^3>	Select the International Character Set.	24
[ESC]	- <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	Set underline. n=0 end n=1 begin	35
[ESC]	0	1BH,30H	&%ST	Set 1/8-inch line space.	18
[ESC]	1	1BH,31H	&%SG	Set 7/72-inch line space.	19
[ESC]	2	1BH,32H		Begin variable line spacing. (This enables [ESC] A n).	19

[ESC]	3 <n>	1BH,33H	&%SV <m^1><m^2> <m^3>	Set fine line space n/216-inch. Where n=1..255 defines the feed used by line feed.	18
[ESC]	4	1BH,34H	&%ST	Set top of form.	20
[ESC]	5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	Set auto line feed. n=0 end n=1 begin	21
[ESC]	8	1BH,38H	&%PF	Disable paper error sensing.	52
[ESC]	9	1BH,39H	&%PO	Enable paper error sensing.	52
[ESC]	:	1BH,3AH	&%F2	Set 12 cpi.	30
[ESC]	<	1BH,3CH	&%PT	Set print suppress and pass through.	59
[ESC]	=<$n>^1$ <$n>^2$ <start code> <data>	1BH,3DH		Download character font image.	27
[ESC]	> <n>	1BH,3EH		Enable custom character set. n=0 OFF n=1 ON	16
[ESC]	? <m><n>	1BH,3FH		Reassign graphic mode.	46
[ESC]	A <n>	1BH,41H		Set variable line spacing to n/72. Where n=1..85 is enabled by [ESC] 2.	19
[ESC]	B <$n>^1$<$n>^2$ <$n>^3$... <$n>^k$ <0>	1BH,42H		Set vertical tabs at lines n^1 n^2 ... n^k 0.	20
[ESC]	C <n>	1BH,43H	&%	Set form length in lines or inches.	21
[ESC]	D <$n>^1$<$n>^2$ <$n>^3$... <$n>^k$ <0>	1BH,44H		Set horizontal tabs at columns n^1 n^2 ... n^k 0.	16
[ESC]	E	1BH,45H	&%MM	Begin emphasized print (half-speed).	36
[ESC]	F	1BH,46H	&%CM	End emphasized print.	36
[ESC]	G	1BH,47H	&%ME	Begin enhanced print (double pass).	36
[ESC]	H	1BH,48H	&%CE	End enhanced print.	36
[ESC]	I <n>	1BH,49H	&%QT {n=0} &%QU {n=1} &%QS {n=2} &%QL {n=3}	Select print mode . n=0 High Speed Draft n=1 Utility n=2 NLQ Sans-Serif n=3 NLQ Courier	22
[ESC]	J <n>	1BH,4AH	&%FM <m^1><m^2><m^3>	Do a fine line feed n/216 inch. n=0 no line feed n=1..255	18
[ESC]	K <$n>^1$ <$n>^2$	1BH,4BH		Set single-density graphics. n^1=0..255 n^2=0..3 len=n1 +256*n2	44
[ESC]	L <$n>^1$ <$n>^2$	1BH,4CH		Set double-density half-speed graphics. n^1=0..255 n^2=0..3 len=n1 + 256*n2	44
[ESC]	P <n>	1BH,50H	&%RF {n=1} &%RI {n=2} &%RN {n=0}	Set rotated font. n=0 normal n=1 rotated 90° n=2 rotated 270°	

[ESC]	R	1BH,52H	&%HV	Reset horizontal and vertical tabs to defaults.	17
[ESC]	S <n>	1BH,53H	&%SB {n=1} &%SP {n=0}	Select superscript/subscript. n=0 superscript n=1 subscript	37
[ESC]	T	1BH,54H	&%SE	End superscript/subscript.	37
[ESC]	U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	Select bidirectional/unidirectional print. n=0 bidirectional n=1 unidirectional	46
[ESC]	V <n>	1BH,56H		Set intercharacter spacing.	31
[ESC]	W <n>	1BH,57H	&%FS {n=0} &%FD {n=1} &%FH {n=3}	Set multiline double-wide double-high sequence. n=0 end all n=1 begin double-wide n=2 double high n=3 both	33
[ESC]	X <n_1><n_2>	1BH,58H		Set left and right margins. n1=left in characters n2=right in characters	
[ESC]	Y <n^1><n^2>	1BH,59H		Set double-density full-speed graphics. n^1=0..255 n^2=0..3 len=n1 +256 * n2	44
[ESC]	Z <n^1><n^2>	1BH,5AH		Set quad-density full-speed graphics. n^1=0..255 n^2=0..3 len=n1 +256 * n2	44
[ESC]	[@ ...	1BH,5BH, 40H		Set print style. (See command description.)	33
[ESC]	[P <n>	1BH,5BH, 50H	&%F1-7	Set character pitch.	31
[ESC]	[T <n>	1BH,5BH, 54H	&%CP <m^1><m^2><m^3><m^4>	Set character set by code page.	26
[ESC]	]	1BH,5DH	&%LR	Set reverse line feed.	21
[ESC]	^<n>	1BH,5EH	&%CC <m^1><m^2><m^3>	Set print control code.	27
[ESC]	_ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	Enable overscore. n=0 end n=1 begin	35
[ESC]	a <n>	1BH,61H	&%JL {n=0} &%JC {n=1} &%JR {n=2}	Set justification. n=0 left n=1 center n=2 right n=4 180° right n=5 180° center n=6 180° left 180° mode not available in IPCL.	17

[ESC]	b <n> ... [ETX]	1BH,62H	&%25 {n=0} &%39 {n=1} &%12 {n=2} &%UP {n=3} &%EA {n=4} &%UE {n=5} &%E8 {n=6} &%93 {n=7} &%HB {n=10}	Print bar code. n=0 Interleave 2 of 5 n=1 Code 39 n=2 Code 128 n=3 UPC A n=4 EAN-13 n=5 UPC-E n=6 EAN-8 n=7 Code 93 n=10 Hollerith	48
[ESC]	D <n>	1BH,64H	&%FL <m^1><m^2>	Feed <n> lines at the current spacing.	19
[ESC]	Q<n>	1BH,71H	None	Set query marker.	
[ESC]	r <n>	1BH,72H	&%R0 {n=0} &%R1 {n=1} &%R2 {n=2} &%R3 {n=3}	Set rotated print. n=0 end n=1 rotate by 90° n=2 rotate left 180° n=3 rotate by 270°	40
[ESC]	s <n>	1BH,73H	&%RL <m^1><m^2><m^3>	Set rotated print line length. n = 1..128 (Default 80)	42
[ESC]	u <$n>^1$ <$m>^1$ <$n>^2$ <$m>^2$... <$n>^k$ <0>	1BH,75H	&%RS	Set rotated print line spacing. nk=0 end where n=line and m=dots from last line. Note: All lines not specified are set to 1 dot.	43
[ESC]	v	1BH,76H	&%FC	Cycle receipt cutter.	53
[ESC]	w <n>	1BH,77H		Enable dynamic response.	60
[ESC]	x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	Open cash drawer. n=1 n=2	57
[ESC]	y <n>	1BH,79H	&%Y0 - 7	Control diagnostics and extended features. (See description.)	59
[ESC]	~ <n>	1BH,7EH		Diagnostics commands enabled by [ESC]y<8>. See command description for <n>.	27

Control Codes Summary by Function

Normal ASCII	Second ASCII field	Hex Code	IPCL equivalent code	Description	Page
				Print/paper motion	
[CR]		0DH	&%CR	Set carriage return.	15
				Vertical motion	
[LF]		0AH	&%LF	Set line feed.	15
[VT]		0BH	&%VT	Set vertical tabs.	20
[FF]		0CH	&%FF	Set form feed.	20
[ESC]	0	1BH,30H	&%ST	Set 1/8-inch line space.	18
[ESC]	1	1BH,31H	&%SG	Set 7/72-inch line space.	19
[ESC]	2	1BH,32H		Begin variable line spacing. (Enable [ESC] A n).	19
[ESC]	3 <n>	1BH,33H	&%SV <m^1><m^2><m^3>	Set fine line space n/216 inch where n=1..255 defines the feed used by line feed.	18
[ESC]	4	1BH,34H	&%ST	Set top of form.	20
[ESC]	5 <n>	1BH,35H	&%CA {n=0} &%MA {n=1}	Set auto line feed. n=0 end n=1 begin	21
[ESC]	A <n>	1BH,41H		Set variable line spacing n/72 where n=1..85 is enabled by [ESC] 2.	19
[ESC]	B <n^1><n^2> <n^3>... <n^k <0>	1BH,42H		Set vertical tabs at lines n^1 n^2... n^k 0.	20
[ESC]	C <n>	1BH,43H	&%	Set form length in lines or inches.	21
[ESC]	J <n>	1BH,4AH	&%FM <m^1><m^2><m^3>	Do a fine line feed n/216 inch. n=0 no line feed n=1..255	18
[ESC]	R	1BH,52H	&%HV	Reset horizontal and vertical tabs to defaults.	17
[ESC]	]	1BH,5DH	&%LR	Reverse line feed.	21
[ESC]	d <n>	1BH,64H	&%FL <m^1><m^2>	Feed <n> lines at the current spacing.	19
				Horizontal motion	
[HT]		09H	&%HT	Set horizontal tabs.	16
[ESC]	D <n^1><n^2> <n^3>... <n^k <0>	1BH,44H		Set horizontal tabs at columns n^1 n^2 ... n^k 0. The maximum value of n depends on the station selected.	16
[ESC]	R	1BH,52H	&%HV	Reset horizontal and vertical tabs to defaults.	17
[ESC]	V <n>	1BH,56H		Set intercharacter spacing.	31
[ESC]	X <n_1><n_2>	1BH,58H		Set left and right margins. n_1=left in characters n_2=right in characters	
[ESC]	a <n>	1BH,61H	&%JR &%JC &%JL	Set justification. n=0 left n=1 center n=2 right n=4 180° right n=5 180° center n=6 180° left 180° mode not available in IPCL.	17

[ESC]	U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	Select bidirectional/unidirectional mode. n=0 bidirectional n=1 unidirectional	46
[ESC]	# 0	1BH,23H, 30H	&%QT	Set Normal Print Mode. (HSD is normal.)	22
[ESC]	E	1BH,45H	&%MM	Begin emphasized print (half-speed).	36
[ESC]	F	1BH,46H	&%CM	End emphasized print.	36
[ESC]	G	1BH,47H	&%ME	Begin enhanced print (double pass).	36
[ESC]	H	1BH,48H	&%CE	End enhanced print.	36
[ESC]	I <n>	1BH,49H	&%QT {n=0} &%QU {n=1} &%QS {n=2} &%QL {n=3}	Select print mode. n=0 High Speed Draft n=1 Utility n=2 NLQ Sans-Serif n=3 NLQ Courier	22
[ESC]	[@ ...	1BH,5BH, 40H		Set print style. (See command description.)	33
				International Character Sets	
[ESC]	! <n>	1BH,21H	&%CS<n>	Select International Character Set.	24
[ESC]	[T <n>	1BH,5BH, 54H	&%CP <m^1><m^2><m^3> <m^4>	Set character set by code page.	26
				Custom characters	
[ESC]	$	1BH,24H		Copy ROM character set to RAM character set.	27
[ESC]	=<n>[1] <n>[2] <start code> <data>	1BH,3DH		Download character font image.	27
[ESC]	> <n>	1BH,3EH		Set custom character. n=0 OFF n=1 ON	27
				Character pitch	
[DC2]		12H	&%F3	Set 10 cpi.	30
[ESC]	:	1BH,3AH	&%F2	Set 12 cpi.	30
[SI]		0FH	&%F1	Set 17 cpi.	30
[ESC]	[SI]	1BH, 0FH	&%F4	Set 24 cpi.	30
[ESC]	[P <n>	1BH,5BH, 50H	&%F1-7	Set character pitch.	31
				Character attributes	
[SO]4		0EH	&%MW	Set one-line double-wide mode.	32
[DC4]		14H	&%MN	Cancel one-line double-wide mode.	32
[ESC]	> <n>	1BH,3EH		Set custom character. n=0 OFF n=1 ON	27
[ESC]	% G	1BH,25H, 47H	&%MI	Begin italics.	37
[ESC]	% H	1BH,25H, 48H	&%CI	End italics.	37
[ESC]	- <n>	1BH,2DH	&%CU {n=0} &%MU {n=1}	Set underline. n=0 end n=1 begin	35
[ESC]	S <n>	1BH,53H	&%SB {n=1} &%SP {n=0}	Select superscript/subscript. n=0 superscript n=1 subscript	37
[ESC]	T	1BH,54H	&%SE	End superscript/subscript.	37

[ESC]	W <n>	1BH,57H	&%FS {n=0} &%FD {n=1} &%FH {n=3}	Set multiline double-wide double-high sequence. n=0 end all n=1 double-wide n=2 double-high n=3 both	33
[ESC]	_ <n>	1BH,5FH	&%CO {n=0} &%MO {n=1}	Set overscore. n=0 end n=1 begin	35
				Rotated print	
[ESC]	P <n>	1BH,50H	&%RF {n=1} &%RI {n=2} &%RN {n=0}	Rotate font. n=0 normal n=1 rotated 90° n=2 rotated 270°	23
[ESC]	r <n>	1BH,72H	&%R0 {n=0} &%R1 {n=1} &%R2 {n=2} &%R3 {n=3}	Rotate print. n=0 end n=1 rotate by 90° n=2 rotate left 180° n=3 rotate by 270°	40
[ESC]	s <n>	1BH,73H	&%RL <m^1><m^2><m^3>	Set rotated print line length. n=1..128 (Default 80)	42
[ESC]	u <$n>^1$ <$m>^1$ <$n>^2$ <$m>^2$ ... <$n>^k$ <0>	1BH,75H	&%RS	Set rotated print line spacing. nk=0 End where n=line and m=dots from last line. Note: All lines not specified are set to 1 dot.	43
				Graphics	
[ESC]	* <m> <$n>^1$ <$n>^2$	1BH,2AH		Print Epson 9-pin graphics in mode <m>.	46
[ESC]	? <m><n>	1BH,3FH		Reassign graphic mode.	46
[ESC]	K <$n>^1$ <$n>^2$	1BH,4BH		Set single-density graphics. n^1=0..255 n^2=0..3 len=n1 +256*n2	44
[ESC]	L <$n>^1$ <$n>^2$	1BH,4CH		Set double-density half-speed graphics. n^1=0..255 n^2=0..3 len=n1 + 256*n2	44
[ESC]	Y <$n>^1$ <$n>^2$	1BH,59H		Set double-density full-speed graphics. n^1=0..255 n^2=0..3 len=n1 +256 * n2	44
[ESC]	Z <$n>^1$ <$n>^2$	1BH,5AH		Set quad-density full-speed graphics. n^1=0..255 n^2=0..3 len=n1 +256 * n2	44
[ESC]	U <n>	1BH,55H	&%GU {n=1} &%GB {n=0}	Select bidirectional/unidirectional mode. n=0 bidirectional n=1 unidirectional	46

				Bar codes	
[ESC]	b <n> ... [ETX]	1BH,62H	&%25 {n=0} &%39 {n=1} &%12 {n=2} &%UP {n=3} &%EA {n=4} &%EA {n=5} &%EA {n=6} &%93 {n=7} &%HB {n=10}	Print bar codes. n=0 Interleave 2 of 5 n=1 Code 39 n=2 Code 128 n=3 UPC A n=4 EAN-13 n=5 UPC E n=6 EAN-8 n=7 Code 93 n=10 Hollerith	48
[ESC]	[EM] B <n>	1BH,19H, 42H	&%BH <m^1>	Set bar code height. n=0 restore defaults n=1-9 number of passes (0.11" per pass)	51
[ESC]	[EM] J <n>	1BH,19H, 4AH	&%BJ <m^1><m^2>	Set bar code justification.	51
				Validation control	
[ESC]	[DC1]	1BH,11H	&%VO	Open for validation.	54
[ESC]	[DC3]	1BH,13H	&%VC	Close for validation.	54
[ESC]	[DC4]	1BH,14H	&%VS	Select validation mode with auto form sense.	54
[ESC]	[EM] C <n>	1BH,19H, 43H	&%ZC <m^1><m^2>	Set validation clamp delay.	55
[ESC]	[EM] V <n>	1BH,19H, 56H	&%ZV <m^1><m^2>	Set validation time out.	55
[ESC]	v	1BH,76H	&%FC	Cycle receipt cutter.	53
				Miscellaneous	
[ESC]	^<n>	1BH,5EH	&%CC	Print control code.	27
[ENQ]	<n>	05H		Set inquire status. (Refer to command descriptions.)	64
[CAN]		18H	&%RP	Clear print buffer.	57
[ESC]	8	1BH,38H	&%PF	Disable paper error sensing.	52
[ESC]	9	1BH,39H	&%PO	Enable paper error sensing.	52
[ESC]	<	1BH,3CH	&%PT	Set print suppress and pass through.	59
[ESC]	q<n>	1BH,71H	None	Set query marker.	
[ESC]	w <n>	1BH,77H	None	Enable dynamic response.	60
[ESC]	x <n>	1BH,78H	&%D1 {n=1} &%D2 {n=2}	Open cash drawer. n=1 n=2	57
				Diagnostics	
[ESC]	y <n>	1BH,79H	&%Y0 - 7	Control diagnostics and extended features. (See descriptions on page 59.)	59
[ESC]	~ <n>	1BH,7EH		Set diagnostics commands enabled by [ESC]y<8>. (See command description for <n>.)	27

Chapter 6:
Operator Panel Controls

Push Buttons - Momentary Switches

The FEED key advances the receipt and journal paper.
The RELEASE key opens and closes the validation clamp. It cycles through open and close mode.
The RESUME key restarts the printer after a failure has been cleared.

Indicators

There are three indicators. They are READY, ALARM, and POWER. The printer can be in any of the following states.

STATE	READY (Green Indicator)	ALARM (Red Indicator)	POWER (Green Indicator)
Ready (The printer is ready to receive data and print.)	On	Off	On
Not ready	Off	Off	On
Off-line			
Ready but waiting for a form	On	Flash	On
Out of paper	Off	On	On
Menu mode	Flash	Off	Flash
Test mode	Flash	Off	On
Printer fault	Off	Flash	On
Printer failure	Off	Off	Off
Watchdog fault (The printer resets.)			

Fault Indicators

If the printer indicates printer fault, the error is not recoverable. The printer must be restarted and may lose information. To aid in printer troubleshooting, the RESUME key will activate an extended diagnostic indication. This will blink the status indicator a number of times. The number of blinks indicates the fault. The fault list follows.

Faults while in operation:

1 Motor move time-out
2 Motor move retry fault
3 Motor move fault (moved in wrong direction)
4 Space motor locked
5 Motor homing fault
6 Motor acceleration fault
7 Printing fault
8 Fault while centering
9 Forms compensation fault

Faults during Level 0 diagnostics:

10 ROM check-sum failure
11 RAM failure
12 Configuration EEPROM failure
13 Processor test fault
14 EEPROM check-sum failure

Faults that can happen at any time:

15 Firmware control fault (loss of program control)
16 Cutter option fault

After the fault code is displayed, the printer can be restarted by pressing the RESUME and RELEASE keys at the same time.

If the EEPROM check-sum fault occurs (Fault Code 14), the EEPROM can be set to default by pressing the RESUME and LF keys at the same time. The printer will be functional but must be reconfigured. This procedure is only to allow reconfiguration and not to recover printer function in the field.

If the indication is printer failure, the printer controller is not running and is being held in reset. If this failure occurs, the printer is not functional and should be serviced.

If the printer appears to go through a power cycle by itself, the hardware watchdog has detected a fault. This fault is generally a hardware failure or an external interference. If the fault is hardware, the printer will continue to cycle through its diagnostics and then reset. If this happens, the printer must be serviced. If the fault is caused by external interference like electrostatic discharge, the printer will generally recover by itself. (Note: The parallel port INIT pin causes a soft reset.)

Chapter 7: Product Self-tests

The Series 150 Printer contains several levels of self-test features. At power on, the printer always runs Level 0 diagnostics which check the printer's operation. After Level 0 diagnostics, the printer checks the keypad and enters normal operation or extended tests.

Level 0 Diagnostics

Level 0 diagnostics always run at power up. They perform the following tasks.

Test	READY (Green Indicator)	ALARM (Red Indicator)	POWER (Green Indicator)
Reset	On	On	On
CPU Test and ROM Test	Off	Off	On
External RAM Test	On	Off	On

If any of these tests fail, the printer will fault, and an error will be displayed.

Extended Diagnostics

Extended diagnostics are entered after Level 0 diagnostics and allow one of four modes to be entered. The four modes are self-test, hex-dump, configuration, and remote configuration. In self-test mode, the various modes of the printer can be tested. Hex-dump mode causes the printer to print the hex value of any print information sent. Configuration mode allows various configuration parameters to be adjusted, and remote configuration mode allows CFG150 to configure the printer.

Self-test

Self test is entered by pressing and holding the RESUME key at power up. (As soon as the printer starts to print, the key should be released). The printer will print the software revision information and instructions for using this mode. The FEED key will feed paper. The RELEASE key will select a test, and the RESUME key will start the test.

There are currently six tests in the test suite. The tests are described below.

1. The Receipt Test prints a sample receipt.
2. The Validation Test performs a sample validation.
3. The Self-test provides a test of a number of the printer's print capabilities.
4. Mechanical Test Mode allows the forms compensation mechanism to be tested.
5. The Rolling ASCII Test allows continuous print on the printer. (It tests reliability and ribbon life).
6. The Burn In Test is used as part of the production process to assure that the printer functions correctly and to provide an initial burn in.

Chapter 8:
Hex-dump Mode

Hex-dump mode is entered by pressing and holding the RESUME and RELEASE keys at power up. This mode is used to diagnose communication problems with the printer. As information is received by the printer, the information is converted to a HEX/ASCII format and printed. No translation is made which means that no commands are interpreted. All information is converted to HEX/ASCII and printed on the receipt tape. If a carriage return is sent to the printer, it will be translated to 0D in the HEX field and "." in the ASCII field.

The format is as follows:

```
54 68 69 73 20 69 73 20  This is
61 20 74 65 73 74 0D 0A  a test..
```

There are several indications of printer and host communication problems that can be deduced from this test. If the printer is printing all 40 "@" symbols, the parity or the number of bits is wrong. If the printer is printing some Hex 40 "@" symbols when it should be printing other characters, either the parity, baud rate, or the bit length setting is wrong. If the printer prints incorrect characters (like Hex C1 instead of Hex 41 "A"), it is set for 8-bit data, and the host is set for 7-bit. In most cases, the print problem can be traced to the host and printer not being configured in the same way.

Chapter 9: Configuration Mode

Initial Power ON

The initial power cycle of a Series 150 diagnostic will find that the EEPROM is not valid. Remaining in Level 0 diagnostics for about ten seconds will indicate this. During this time, the EEPROM is initialized and a default configuration loaded. The default will allow manual or remote configuration. It is unlikely to be the desired configuration.

Manual Configuration[13]

This mode is entered by pressing and holding the FEED and RESUME keys at power up. (As soon as the printer starts to print, the keys should be released). The printer will print the software revision information and instructions for using manual configuration.

- The RESUME key will select the next group.
- The RELEASE key will select the next item.
- The RELEASE and RESUME keys together will select the next option.
- The RESUME and FEED keys together will print a list of all the settings.
- The FEED key will feed paper.

Once in configuration mode, the item to be changed should be selected with the RELEASE and RESUME keys. The item is then changed with the RESUME and RELEASE keys pressed together. It should be noted that in test mode keys operate when released and not when they are pressed. This allows for multiple key depressions to be recognized.

When the proper configuration is selected, it should be verified by printing the complete configuration. The save configuration option should then be changed from no to yes. The next group selected will save the configuration and enter normal operation.

Enable Remote Configuration

Remote configuration mode allows a remote host to set up, display configuration information, and test a Series 150 Printer. This mode is designed to be operated by the CFG150 program running on a PC.

To enable remote configuration, connect a PC through the serial or parallel port on the Series 150 Printer. Load the configuration program into the PC, and enter configuration mode. Power on the printer, and hold the FEED and RELEASE keys down. After Level 0 diagnostics, the printer will enter CFG150 Mode. Refer to the CFG150 User's Guide section of this manual for more information.

[13] Manual configuration may be locked by remote configuration. If this is the case, the only way to alter the configuration is by remote CFG150 configuration.

Feature Configuration

The Series 150 Printer has many configurable features. The following section discusses these features and the possible configurations. An operator can configure most of the features by manipulating the key panel in configuration mode. This method is termed manual configuration.

Features can be configured by the CFG150 program. This program runs on most standard PC computers. The CFG150 section of this manual describes how CFG150 operates. This section lists the configurations that can be set by CFG150.

Configuration features are grouped into six categories. Each category has several features, and each feature has one or more selections. The following table lists all the groups, features, and selections. The default factory settings are indicated with an "*"[14] which may not be the same as initial power up configuration.

General		Recommendation
Emulation Mode	The Series 150 Printer supports several emulation modes, Normal (IBM-like), EPOS (Epson-like), MICROLINE (Okidata-like), STAR (Star-like), or NCR2567(NCR-like)	
	IBM	
	EPOS	
	MICROLINE	
	STAR	
	NCR2567	
Configuration	The Series 150 Printer supports several emulations and custom configurations. These options are intended to support those special modes.	
	Normal	
	Option 1 Epson Emulation: [ESC] 3 <n> sets line spacing. The default resolution is n/144. With this option, the resolution will be n/360. Microline Emulation: [CAN] will return the printer to default. NCR2567 Emulation: sets the printer to six-line validation.	
	Option 2 NCR2567 Emulation allows the printer to select extended IBM Code.	
	Option 3	
	Option 4	
	Option 5	
	Option 6	
	Option 7	
Graphics	The default print mode for graphics can be set to bidirectional for fastest print or unidirectional for the best print quality.	
	Bidirectional	
	Unidirectional	

[14] The factory defaults can be altered by customer order.

General		Recommendation
Receive Buffer	The input receive buffer can be configured to various sizes. The optimal size is dependent on the application. The options are from 256 to 6144 bytes. To provide very tight control of the printer, one-line mode is also provided where the printer goes busy after each [CR] and stays busy until the buffer is empty.	
	256 bytes	
	1024 bytes	
	2048 bytes	
	3072 bytes	
	4096 bytes	
	5120 bytes	
	6144 bytes	
	1-line mode	
Print Alignment	The line to line print registration of the printer is adjustable. This registration is important in graphics and rotated print and is set at the factory. However, if the printer has been serviced, this value may need to be adjusted. The adjustment can be from -5 to +5. To aid in setting this adjustment, the printer will print an alignment chart along with the adjustment.	
	Adjust from 0 to 9	3
Impact Energy	To allow the printer to print better on multipart forms, the impact energy supplied to the print head can be increased. In high impact mode, the print speed is decreased by about 15 percent. The high impact is only effective in validation mode.	
	Normal	
	Heavy validation	
Form Sense Wait	The amount of time the printer waits after a form is sensed and before action is taken is adjustable. This is the Form Sense Wait time.	
	It can be adjusted from 0 to 750 milliseconds.	250 ms
Validation Time Out	The printer can be configured to return to receipt mode after a slip or validation command is issued. This time out is adjustable from off (waits forever) to 15 minutes. The slip and validation modes can be individually configured.	
	Off	
	1 to 15 minutes	
Cash Drawer Time	The amount of time the cash drawer is energized is adjustable from 25 to 250 milliseconds. The value will be dependent on the cash drawer being used; however, 150 ms works with most drawers.	
	25 to 250 milliseconds (50 millisecond resolution)	150 ms
Reset Inhibit	The reset command can be prevented from being acted on. If Reset Inhibit is set to on, the command will have no effect. (This does not effect the parallel port INIT signal.)	
	Off	
	On	
Print Suppress and Pass through	The print suppress feature can be off, on, or pass (pass through). This will determine the operation of the print suppress command. If print suppress is set to off, the command will be ignored. If on, the command will be active. If pass is selected, the command and data pass through will be active.	
	Off	
	Suppress	
	Pass through	

General		Recommendation
10 cpi (DC2)	The 10 cpi command can be prevented from being acted on. If set to disable, the printer will ignore the 10 cpi command (DC2).	
	Active	
	Disabled	
Print Illegal Commands		
	No	
	Yes	
Print Zone	There are two print zone settings.	
	Normal (2.40 inch)	
	Narrow (2.83 inch)	
M50 Compatibility	The Ithaca Model 50 Printer uses several commands that are not supported by the M150 Printer. In some cases, these commands have different functions in the M150 Printer. If this option is set, the M50 commands are activated and overlapping M150 commands deactivated.	
	Off	
	On	
Vertical Control		
Line Spacing	The line spacing can be defaulted to 6 or 8 lpi.	
	6 lpi	
	8 lpi	
Auto Line Feed	An auto line feed feature can be set as a default where all [CR]'s will have a [LF] added. If auto line feed is set to on, this feature is activated.	
	Off	
	On	
Auto Carriage Return	An auto carriage return feature can be set as a default where all [LF]'s will have a [CR] added. If auto carriage return is set to on, this feature is activated.	
	Off	
	On	
Form Length	The default form length can be set from 3 to 17 inches. This configuration affects how the [FF] command operates.	
	3 to 17 inches	11
Line Feeds Before Cut	The number of line feeds before a cut operation is performed can be set from 0 to 15 lines.	
	0 to 15 lines	0
Character		
Print Mode	The default print mode can be set to Draft, Utility, NLQ Courier, or NLQ Sans Serif. In most cases, Draft or Utility mode will be the default selections.	
	Draft	
	Utility	
	NLQ Courier	
	NLQ Sans Serif	
Character Pitch	The default print pitch can be set to 8, 10, 12, 15, 17.1, 20, or 24 characters per inch.	
	8 cpi	
	10 cpi	
	12 cpi	
	15 cpi	
	17.1 cpi	
	20 cpi	
	24 cpi	

General		Recommendation
Font	The Series 150 Printer supports 66 Language Sets. This setting defines only the default printer mode. Any set can be selected through software.	
Language Set	IBM specifies code pages differently than Epson. This is the IBM description	
	IBM Code Page Translation Table	
	437 – USA	
	850 – Multilingual	
	865 – Norway	
	860 – Portugal	
	863 – Canada French	
	852 – East Europe Latin II	
	1018 – ECMA-94	
	1028 – Roman-8	
	861 – Icelandic-861	
	774 – Baltic_774	
	1026 – ISO Latin 4 (8859/4)	
	1029 – ISO Latin 6 (8859/10)	
	1034 – Windows Baltic	
	1035 – Cyrillic-Latvian	
	1033 – KBL-Lithuanian	
	1012 – Turkey	
	1021 – Latin 5 (Windows Turkey)	
	857 – Turkey_857	
	1008 – Greek_437	
	1009 – Greek_928	
	869 – Greek_869	
	1020 – Windows Greek	
	1011 – Greek_437 CYPRUS	
	862 – Hebrew NC (862)	
	1030 – Hebrew NC (862)	
	1031 – Hebrew OC	
	1032 – Windows Hebrew	
	1015 – ISO Latin 2	
	1019 – Windows East Europe	
	1014 – Polska Mazovia	
	895 – Kamenicky (MJK)	
	1024 – Hungarian CWI	
	1016 – Serbo Croatic I	
	1017 – Serbo Croatic II	
	1027 – Ukrainian	
	1072 – Bulgarian	
	1022 – Windows Cyrillic	
	855 – Cyrillic I – 855	
	866 – Cyrillic II – 866	
	1013 – Cyrillic II – 866	
	65 – ASCII (Unslashed 0)	
	67 – German	
	66 – British	
	69 – Swedish I	
	74 – French Canadian	
	72 – Dutch	
	76 – Swedish II	
	77 – Swedish III	
	78 – Swedish IV	
	79 – Turkish	

	80 – Swiss I	

General		Recommendation
	81 – Swiss II	
	90 – Publisher	
	91 – Welsh	
	68 – French	
	70 – Danish	
	71 – Norwegian	
	64 – ASCII (Slashed 0)	
	73 – Italian	
	75 – Spanish	
	91 – Welsh	
EPOS Mode Code Page	Epson specifies code pages differently than IBM. This is the Epson description.	
	0 – USA	
	26 – Multilingual	
	27 – Norway	
	28 – Portugal	
	43 – Canada French	
	46 – East Europe Latin II – 852	
	42 – ECMA-94	
	58 – Roman-8	
	73 – Icelandic-861	
	74 – Baltic_774	
	56 – ISO Latin 4(8859/4)	
	67 – ISO Latin 6 (8859/10)	
	68 – Windows Baltic	
	69 – Cyrillic-Latvian	
	63 – KBL-Lithuanian	
	29 – Turkey	
	51 – Latin 5 (Windows Turkey)	
	57 – Turkey_857	
	38 – Greek_437	
	39 – Greek_928	
	47 – Greek_869	
	50 – Windows Greek	
	41 – Greek_437 CYPRUS	
	60 – Hebrew NC (862)	
	61 – Hebrew OC	
	62 – Windows Hebrew	
	23 – ISO Latin 2	
	49 – Windows East Europe	
	22 – Polska Mazovia	
	55 – Kamenicky (MJK)	
	54 – Hungarian CWI	
	24 – Serbo Croatic I	
	25 – Serbo Croatic II	
	66 – Ukrainian	
	72 – Bulgarian	
	52 – Windows Cyrillic	
	44 – Cyrillic I – 855	
	21 – Cyrillic II – 866	
	45 – Cyrillic II – 866	
	1 – French	
	2 – German	
	3 – British	
	4 – Danish I	

	5 – Swedish I	
	6 – Italian	
	7 – Spanish I	

General		Recommendation
	8 – Japanese	
	9 – Norwegian	
	10 – Danish II	
	11 – Spanish II	
	12 – Latin American	
	13 – French Canadian	
	14 – Dutch	
	15 – Swedish II	
	16 – Swedish III	
	17 – Swedish IV	
	18 – Turkish	
	19 – Swiss I	
	20 – Swiss II	
	64 – Publisher	
Zero Character	The zero character can be configured to be unslashed or slashed in all character sets except IBM 64 and 65 which override this setting.	
	Unslashed	
	Slashed	
Interface	The Series 150 Printer supports either a serial or parallel communication link.	
Parallel Mode	This setting should not be changed except from parallel to IEEE 1284.	
	Parallel	
	IEEE 1284	
Parallel Link Options	The parallel option features define how the strobe, busy, and acknowledge signals operate. In normal mode, the printer follows the standard (Centronics) parallel port conventions. With Options 1 and 3, the acknowledge and busy signals change at the same time. This is sometimes referred to as Ack-after-Busy. Options 2 and 3 force busy high on the rising edge of strobe. This is sometimes referred to as Busy-while-Strobe timing. In all cases, the data is latched on the rising edge of the strobe. In most cases, the normal timing mode will give the best and most universal results.	
	Normal Ack-while-Busy	
	Option 1 Ack-after-Busy	
	Option 2 Ack-while-Busy	
	Option 3 Ack-after-Busy	
Parity	The serial mode parity can be set to none, odd, or even.	
	None	
	Odd	
	Even	
Bit Data	The serial bit format can be set to 8 or 7.	
	8	
	7	
Protocol	The flow control protocol/serial link can be set to Ready/Busy or XON/XOFF. If XON/XOFF is selected, Ready/Busy also functions.	
	Ready/Busy	
	XON/XOFF	

General		Recommendation
Baud Rate	The bit rate of the printer can be set to 19200, 9600, 4800, 2400, 1200, 600, or 300 bits per second. The same bit rate is for send and receive.	
	19200 bits per second	
	9600 bits per second	
	4800 bits per second	
	2400 bits per second	
	1200 bits per second	
	600 bits per second	
	300 bits per second	
SSD Signal	The serial port SSD signal can be configured to provide flow control. If SSD is active, it will toggle to false when the buffer is full. Note: SSD flow control is only available on the optional 25-pin serial interface.	
	Not used	
	Active	
DTR/RTS Signal	The serial port DTR and/or RTS signal can be configured to provide flow control. If DTR is configured as the flow control signal, it will toggle to false when the buffer is full, RTS will not.	
	Not used	
	DTR flow	
	RTS flow	
	RTS and DTR flow	
CTS Signal	If active, a false CTS will prevent the printer from sending any data to the host.	
	Not used	
	Active	
DSR Signal	If active, a false DSR signal will prevent the printer from accepting any data.	
	Not used	
	Active	
Off-line	This can be set to active (normal operation) or buffer full only. In active mode, the printer will go off-line when the printer runs out of paper. In buffer full only, the printer will only go off-line if a fault is detected. The buffer full operates normally.	
	Active	
	Buffer full only	
Microsoft Windows Plug and Play	This option allows Windows to query the printer as to its identity. The printer supports this in parallel and serial mode. This option presets several of the link modes. Serial mode RTS flow control Parallel mode IEEE 1284	
	Off	
	On	
Multidrop	If set to an address, the multidrop feature will be activated at power up.	
	Off	
	A device	
	B device	

	C device	
Options		
Knife	This specifies that the knife is attached.	
	Not present	
	Enabled	
Validation	This specifies that the unit has validation.	
	Not present	
	Enabled	

General		**Recommendation**
Journal	This specifies that the unit has journal take-up.	
	Not present	
	Enabled	
Save Changes	This is set only in self-configuration to force the printer to save changes. If this is not set to yes, any changes made to the configuration will not be saved.	
	No	
	Yes	

General Control

The Series 150 Printer supports several printer emulation modes, Normal (IBM-like), EPOS (Epson-like), MICROLINE (OKIDATA-like), STAR (STAR-like), and NCR2567 (NCR-like).

The default print mode for graphics can be set to bidirectional for fastest print or unidirectional for the best print quality.

The input receive buffer can be configured to various sizes. The optimal size is dependent on the application. The options are from 256 to 6144 bytes. To provide very tight control of the printer, a one-line mode is also provided where the printer goes busy after each [CR] and stays busy until the buffer is empty.

The line to line print registration of the printer is adjustable. This registration is important in graphics and rotated print and is set at the factory. However, if the printer has been serviced this value may need to be adjusted. The adjustment can be from 0 to 9. To aid in setting this adjustment, the printer will print an alignment chart.

To allow the printer to print better on multipart forms, the impact energy supplied to the print head can be increased. In high impact mode, the print speed is decreased by about 15 percent. The high impact is only effective in validation mode.

The amount of time the printer waits after a form is sensed and before action is taken is adjustable. This is the Form Sense Wait time. It can be adjusted from 0 to 750 milliseconds. The default is 250 milliseconds.

The printer can be configured to return to receipt mode after a validation command is issued. This time out is adjustable from off (waits forever) to 15 minutes.

The amount of time the cash drawer is energized is adjustable from 25 to 250 milliseconds. This value will be dependent on the cash drawer being used; however, 150 milliseconds works with most drawers.

The reset command (EPOS mode only) can be prevented from being acted on. If reset inhibit is set to on, the command will have no effect. (This does not effect the parallel port INIT signal).

The print suppress feature can be off, on, or pass (pass through). This will determine the operation of the print suppress command. If print suppress is set to off, the command will be ignored. If on, the command will be active. If pass is selected, the command and data pass through will be active.

Vertical Control

The line spacing can be defaulted to 6 or 8 lines per inch (lpi).

An auto line feed feature can be set as a default where all [CR]'s will have a [LF] added. If auto linefeed is set to on, this feature is activated. An auto line feed feature can be set as a default where all [LF]'s will have a [CR] added. If auto CR is set to on, this feature is activated.

The default form length can be set from 3 to 17 inches. This configuration affects how the [FF] command operates.

Character

The default print mode can be set to Draft, Utility, NLQ Courier, or NLQ Sans Serif. In most cases, Draft or Utility mode will be the default selections.

The default print pitch can be set to 8, 10, 12, 15, 17.1, 20, or 24 characters per inch.

Interface

The Series 150 Printer has either a serial or parallel communications link. In the parallel configuration, you can enable it as IEEE 1284, which allows a bidirectional mode.

The parallel option features define how the strobe, busy, and acknowledge signals operate. In normal mode, the printer follows the standard (Centronics) parallel port conventions. With Options 1 and 3, the acknowledge and busy signals change at the same time. This is sometimes referred to as Ack-after-Busy. Options 2 and 3 force busy high on the rising edge of strobe. This is sometimes referred to Busy-while-Strobe timing. In all cases, the data is latched on the rising edge of strobe. In most cases, the normal timing mode will give the best and most universal results.

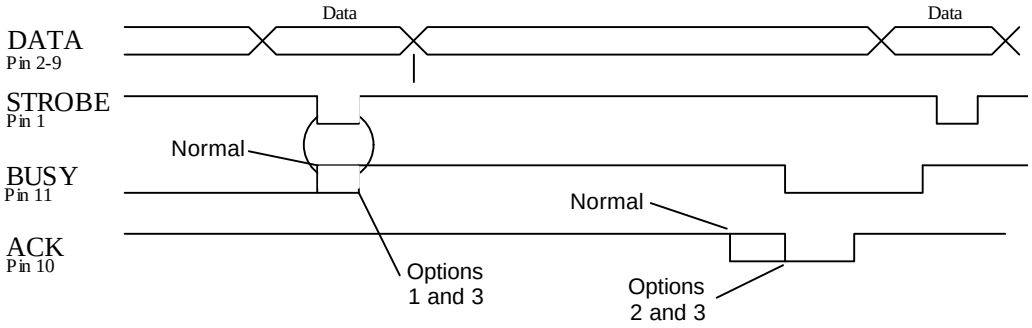


Figure 14 Parallel link options

The serial mode parity can be set to none, odd, or even. The serial bit format can be set to 8 or 7. The flow control protocol/serial link can be set to Ready/Busy or XON/XOFF. If XON/XOFF is selected, Ready/Busy also functions.

The bit rate of the printer can be set to 19200, 9600, 4800, 2400, 1200, 600, or 300 bits per second. The same bit rate is for both send and receive.

The serial port DTR and/or RTS signal can be configured to provide flow control. If DTR is configured as the flow control signal, it will toggle to false when the buffer is full, RTS will not.

Options

The knife is an optional feature on the M150 Printer. If the hardware is installed, the corresponding feature should be activated.

Save Changes

In self-configuration, the save changes must be set to “yes” for any configuration changes to be accepted. The next group selection will then save the changes and start normal operation.

Chapter 10: Communications Protocol and Print Buffers

Overview

The following figure illustrates the communication flow from the host computer to the printer and from the printer to the cash drawer.

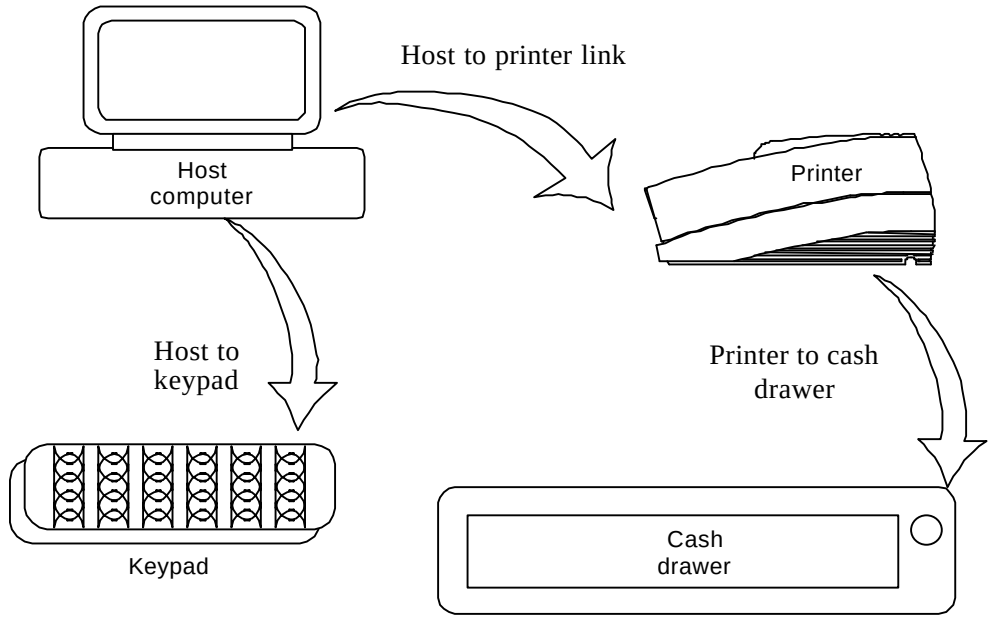


Figure 15 Typical POS system

For the host to printer communication link, the Series 150 Printer supports serial or parallel communications. The serial and parallel port both follow standards developed for the PC environment.

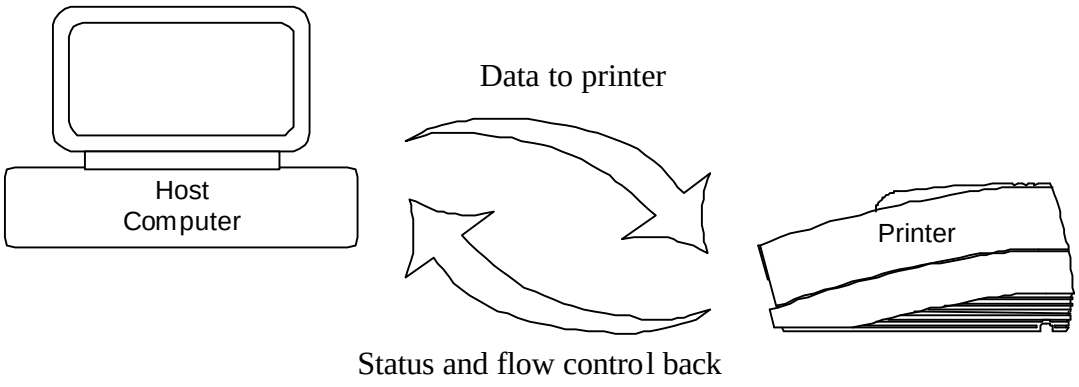


Figure 16 Host to printer link

In most cases, the host computer is capable of sending information to the printer much faster than the printer can print it. To prevent information from being lost, a flow control mechanism is provided. This mechanism is called the flow control protocol. The goal of the flow control protocol is to exchange as much information as possible as fast as possible without losing any data. The Series 150 supports three flow control protocols, two in serial mode and one in parallel.

From the printer's point of view there are four basic functions that are required of communications. All four are common to all three flow control protocols. There must be a communication driver, status inquire procedure, storage buffer, and print control mechanism that is using the data.

1. The communication port is either the serial port hardware or the parallel port hardware and the associated communication software driver.
2. A means for the host to bypass the buffer for status information is also required because the buffer offsets the printer in time from the host. (The printer is generally behind the host).
3. The storage print buffer is a software implemented, first-in/first-out circular buffer. It stores information in an asynchronous fashion where information can be placed in it at any rate and retrieved from it at any rate. However, the information order is not altered. Any buffer has a finite size, and if information is put in faster than it is taken out, it will overflow. To avoid overflow, a flow control mechanism is required.
4. The print control mechanism is the remainder of the printer hardware and control software. It interprets control codes and operates the control panel, print head, and cash drawer interface.

The following figure illustrates the four basic parts of printer flow control.

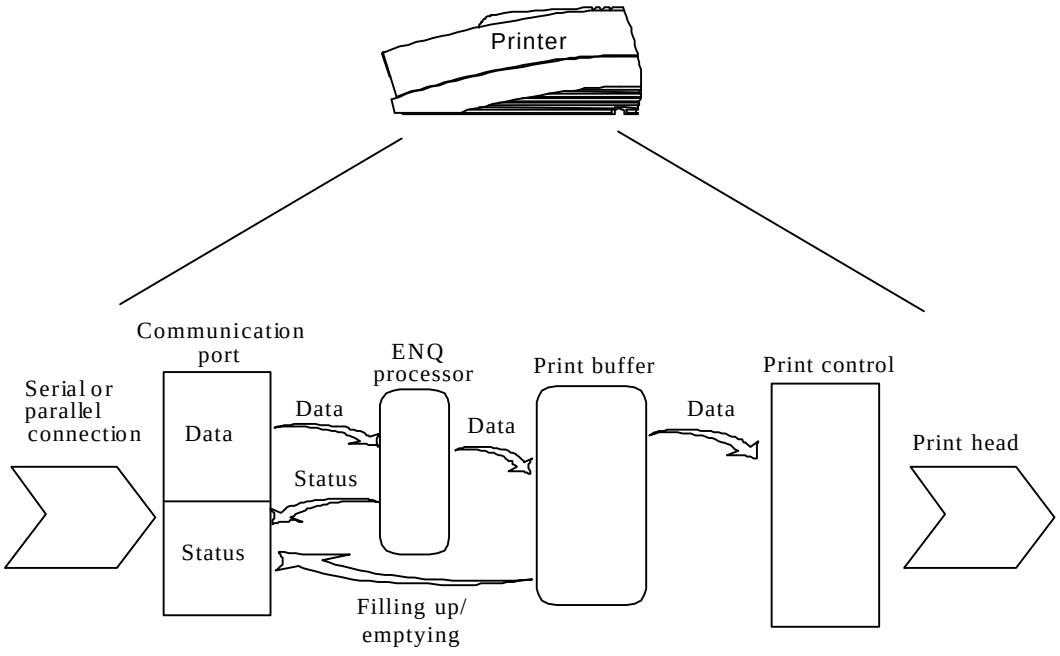


Figure 17 Printer communications buffer flow

The communication port is either serial or parallel and is controlled by a software communication driver. This driver receives data and returns requested status. As information is received from the host, data is taken from the communication port hardware by the driver, preprocessed to look for status inquire commands, and placed in the buffer. When the buffer input function finds that the

buffer is filling up, it notifies the communication driver to implement flow control. Flow control will attempt to stop further information from being sent by the host.

The print control software takes information from the buffer (as it needs it and can use it). When the buffer output function finds that the buffer is getting low, it notifies the communication driver that the information flow can be resumed (if it was stopped) and allows more information to be placed in the buffer.

The Series 150 Printer has a configurable input buffer. The printer can be configured to allow from 256 to 6144 bytes of input buffer. This means that up to 6144 characters (or control codes) can be sent to the printer before they are interpreted and printed. In effect, the host computer can get 6144 characters ahead of the printer. In all cases, the buffer will resume communications when it is half empty. For example, if the buffer is configured to be 2K, the printer will signal stop when 2048 bytes are in the buffer. Resume will be signaled when 1024 bytes remain.

ENQ commands are preprocessed which means they are found in the input data stream and acted upon immediately as they are received. This means that the status returned is valid as of the time the command is received. This is termed real-time status even though ENQ commands are preprocessed and still placed in the buffer. Real-time status assures that data is not lost when the ENQ sequence is part of another command. However, this also means that the buffer may be filled by ENQ commands, if the printer is waiting for some activity.

Parallel Port

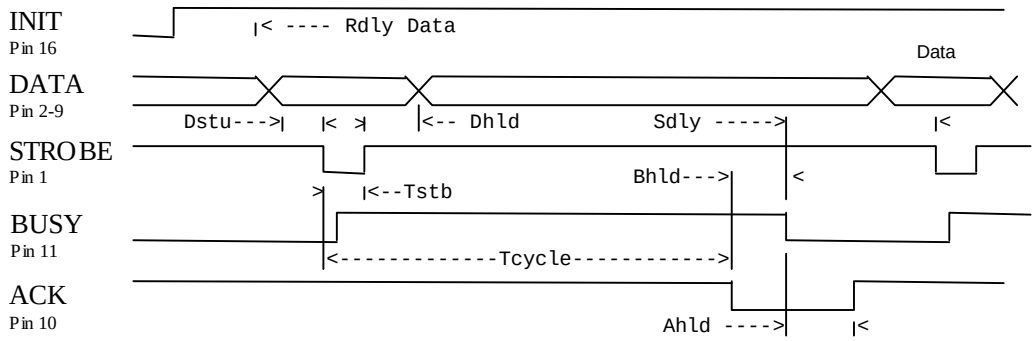
Parallel Port Protocol

The Series 150 parallel port behaves just like any printer connected to a PC. The parallel interface accepts 8-bits of data from the host. The strobe signal from the host is used to indicate that data is available. When the printer sees the strobe and has accepted the data, it asserts a busy signal. The busy signal indicates to the host that the printer has accepted the data and is busy working on it. When the printer has been able to absorb the data and is ready to accept another byte, the printer asserts an acknowledge signal, negates busy, and finally negates acknowledge.

The following parallel port specifications and timing should be met by the host computer. In standard PC's, the strobe signal is generated by software writes to the parallel port control port. This is typically done in the BIOS or in some parallel port driver. As PC's become faster, it is up to the software to assure that the strobe signal does not get too narrow. One microsecond is about the minimum pulse width that should be sent down a cable. Shorter pulse widths (500 nanosecond) will be accepted by the printer; however, the cable can introduce significant signal degeneration and skew.

It is very important that the data be valid before the strobe signal is asserted and remain valid until after the strobe is removed. A 500 nanosecond setup and hold time is required by the printer.

The following chart illustrates this sequence:



Rdly approximately 2 s	Bhld approximately 5 us
Dstu 500 ns (min)	Ahld approximately 5 us
Dhld 500 ns (min)	Sdly 3 us (min)
Tstb 1 us (min)	Tcycle 200 - 280 us (typ)

Figure 18 Parallel port data timing

To implement flow control, the busy signal is asserted by the printer outside the normal data transfer sequence.

The busy signal has several uses, but it always indicates that the printer cannot accept information. The busy signal may happen at any time and may not adhere to the above timing chart in all cases. It is up to the host's parallel port driver to handle all possible busy states. It is important that the host driver does not hang-up if it takes some time for an acknowledge response to a strobe signal. The standard PC parallel port hardware implements an interrupt on acknowledge signal to make this task easier.

Printer Buffer Size

The M150 Printer has a configurable buffer size. It can be set from 256 bytes to 6144 bytes. This allows an application to control how far ahead of the printer it can get. The smaller the buffer is, the tighter the control will be. It is up to the application developer to select the optimal buffer size.

One-line mode

The M150 Printer supports a one-line mode of operation. In this mode, the input buffer is set to 1024 bytes; however, the printer will go busy after every [CR] received. In this mode, the printer will stay busy after the [CR] is received and remain busy until the previous information is printed. There are several features that must be considered when using this mode.

1. The printer only looks at [CR]'s. [LF] will cause the printer to print but will not set busy.
2. If a [CR] character is received as part of another command, i.e, as part of graphics data, the printer will go busy after the [CR] is received, but will go ready after the [CR] is processed.
3. By definition, one-line mode is slow. The printer will not allow the application to get ahead of the printer.

Parallel Port Inquire IEEE 1284

The Series 150 Printer supports the IEEE 1284 bidirectional parallel peripheral interface standard. This standard provides for a bidirectional link on the parallel port. The Series 150 supports Modes 0 and 4 only. This provides a nibble mode reverse channel for printer identification and status inquire command. It is beyond the scope of this guide to describe the IEEE 1284 protocol. The complete specification is available from the

Institute of Electrical and Electronic Engineers, Inc.
345 East 47th Street
New York, NY 10017, USA

Buffer

The Series 150 Printer has a 256-byte buffer that contains information to be returned by the IEEE 1284 reverse link. Information is placed in this buffer in the same format as RS232 serial information is returned.

Inquire commands sent to the printer in IEEE 1284 mode will place responses to the commands in the IEEE 1284 reverse channel buffer. This buffer is then transmitted to the host when the host requests the reverse channel.

Mode 4

Mode 4 provides for the printer to return identification information to the host system. The Series 150 Printer returns:

xx,yy (length of following data, 2 bytes with msb first)
MANUFACTURER: Ithaca-Peripherals;
COMMAND SET: IPCL;
MODEL:150;
COMMENT: Rev. x.xx;
ACTIVE COMMAND SET: IPCL;

When a Mode 4 request is made, the IEEE 1284 buffer is cleared before the ID is sent.

Mode 0

Mode 0 provides a reverse channel for information from the printer.

Normal responses to ENQ commands will be placed in the IEEE 1284 reverse channel buffer. The Mode 0 reverse channel request will begin returning this information to the host. The host may terminate the transmission at any time. If the link is terminated between nibbles, the last nibble is retransmitted on the next request. If a complete byte is transmitted, it is deleted from the IEEE 1284 reverse channel buffer.

There is an ENQ command that will clear the reverse channel buffer before placing its response in the buffer.

The IEEE 1284 buffer is limited to 256 characters. If the buffer is not emptied by reverse channel requests and data transfers, the buffer will overflow. The buffer is a FIFO buffer, and the last data placed in the buffer is lost.

No attempt should be made to send normal data to the printer while the reverse channel is active. Any data sent to the printer in this mode will be lost and may terminate the reverse channel link.

Time out

IEEE 1284 specifies a time out for various phases of the protocol. The Series 150 Printer treats these time outs as minimums. The printer will time out at the specified time only if it is idle during the complete phase.

Active State

The IEEE 1284 reverse channel may be activated at any time as long as the printer is not busy with data. This means that if the printer is off-line the reverse channel may be activated. If the printer is placed back on-line while the reverse channel is active, the printer will not exit the reverse channel mode.

Inquire Responses

In general, ENQ commands place two-byte responses in the IEEE 1284 reverse channel buffer. The two bytes are the same as the serial mode responses. In IEEE 1284 mode, the printer will remain busy until the ENQ command is processed. This assures responses in real time. To get the response, the host must ask for it. It is possible for the host to make a number of requests and then get all the responses; however, the status returned will be valid at the time the request was made.

It is possible for the dynamic response mode to be activated and the reverse channel opened. The reverse channel will then change from reverse idle to reverse data available as the status changes. The application must be careful in dynamic response mode that the dynamic responses are not left active when the reverse channel is closed. If this happens, the buffer will overflow. If there is data in the buffer when dynamic responses are activated, it will not be replaced by current status. If dynamic response is off and a clear buffer command is issued followed by activation of dynamic responses, the buffer will then contain fresh data. If the buffer clear command is issued after the dynamic response is activated, the buffer will be cleared and any unread responses will be lost.

Parallel Port Inquire (Non-IEEE 1284)

All ENQ commands require some type of response from the printer. The serial port is bidirectional; the non-IEEE 1284 parallel port is not. For this reason, the parallel, non-IEEE 1284 operation of ENQ commands is different from serial and IEEE 1284 modes. In serial and IEEE 1284 operation, all ENQ commands are responded to by an acknowledged or not-acknowleged sign and then the command ID on the return link.

In non-IEEE 1284 parallel operation, there is no easy way to return complex information to the host. The paper error signal is driven in response to ENQ's. If a true paper error is being signaled, the ERR line will also be driven. It is, therefore, possible to distinguish between a paper error and an ENQ response.

In parallel, non-IEEE 1284 mode, the printer will respond to the ENQ before the parallel port sequence is complete. When the parallel port acknowledges the ID portion (the second byte) of the ENQ sequence, the PE signal will be valid. The host must, however, remember what status request was made, as the printer has no way of signaling that information. In addition, the host must not interpret the PE signal as an error but as a response to an ENQ.

The PE signal can be configured to respond in two ways. The first is static. The PE will remain valid until the next ENQ is issued. It may also be configured to operate dynamically which means the PE signal will follow the status of the feature being tracked. In all cases, a true paper exhaust is dynamic. True paper error status will not override any other status request. For example, if you want true paper error operation, it must be selected after all other dynamic status requests.

To synchronize ENQ commands with the operation of the paper error signal, the printer will remain busy after the second byte of an ENQ command until the ENQ command is processed. This typically takes about 100 microseconds.

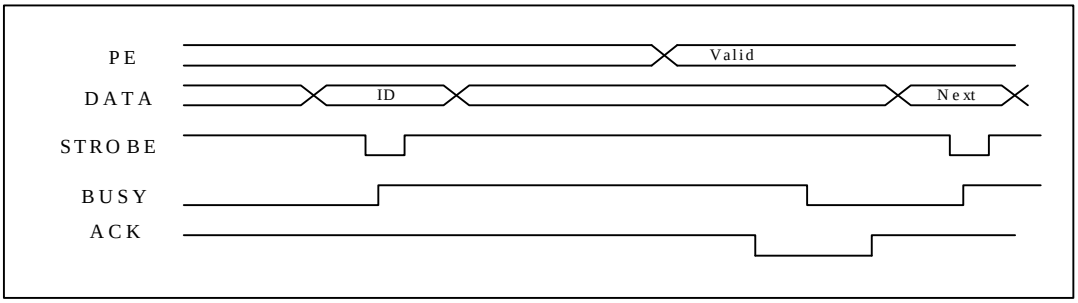


Figure 19 PE to ENQ request timing

It should be noted that ENQ commands are preprocessed (looked at and processed before they are buffered). They are still buffered. This means that the buffer could be filled with ENQ commands if the printer is waiting for some other operation.

Parallel Port Plug and Play

Microsoft Windows implements Plug and Play (PnP) by doing an IEEE 1284 inquire during boot. The M150 Printer will respond to this inquire if IEEE 1284 is active.

If the Windows PnP configuration flag is set in the printer, IEEE 1284 will be active for all parallel port modes. For example, Windows PnP in parallel mode forces IEEE 1284. For PnP to work, the host must have an IEEE 1284 compatible port adapter, and the cable used to connect to the printer must support all the interface signals. The PnP response follows.

Device ID string:
MFG: Ithaca-Periph.;CMD:M150CL,IPCL;CLS:PRINTER;MDL S150 PcOS;DES:Ithaca-Peripherals Series 150;REV:01.13;OPTS;$5xyz
PnP ID: LPTENUM\Ithaca-Periph.S150_PcECB3
Device Description: Ithaca-Peripherals Series 150
Device Class: PRINTER

The OPTS field is always as follows: OPTS;$5XYZ
Where X is a model definition, X and Y are bit fields that designates the options attached to the printer.

Y			X		
Bit 0	→	Alternate print zone	Bit 0	→	Slip capability
Bit 1	→	Undefined	Bit 1	→	Knife module attached
Bit 2	→	Undefined	Bit 2	→	MICR module attached
Bit 3	→	0	Bit 3	→	0
Bits 4-5	→	1	Bits 4-5	→	1
Bits 6-7	→	0	Bits 6-7	→	0

The REV filed is the revision of the software installed in the printer.

Parallel Port Connector

The parallel printer interface is by a 25-pin D-shell connector. The pin out is such that the printer will interface to a standard IBM PC parallel printer interface with a one to one cable.

The INIT\ (initialize) printer input acts as a hardware reset to the printer. This signal must be inactive (high) for about four seconds before the printer will respond to information input.

The paper error signal is asserted by the printer whenever the journal paper is exhausted and an attempt is made to print on the journal. The paper error signal is also asserted in response to [ENQ] commands in parallel, non-IEEE 1284 mode.

The ERR\ signal is asserted if a head jam occurs or if the paper error signal is asserted for a true paper error. **Note:** The AUTOFD (auto feed, Pin 14) and SLIN (Select input, Pin 17) signals are not used by the Series 150 Printer in parallel, non-IEEE 1284 mode.

Pin 1	STROBE	Clock data to printer	Host to Printer
Pin 2-9	D0 - D7	Data	Host to Printer
Pin 10	ACK\	Printer accepted cata	Printer to Host
Pin 11	BUSY	Printer is busy	Printer to Host
Pin 12	PE	Paper out/status	Printer to Host
Pin 13	SLCT	Printer selected	Printer to Host
Pin 14	AUTOFD	Auto feed paper	Host to Printer
Pin 15	ERR\	Printer error	Printer to Host
Pin 16	INIT\	Initialize the printer	Host to Printer
Pin 17	SLIN	Select printer	Host to Printer
Pin 18-25	GND	Ground	

Table 12 Parallel port pin-outs

Signal Levels

Voltage levels 0 V and +5 V (nominal)

Logic levels
- Logic 1
  - Driver +2.4 V to +5 V
  - Receiver +2.0 V to +5 V
- Logic 0
  - Driver 0 V to +0.4 V
  - Receiver 0 V to +0.8 V
  - Driver +2.4 V to +5 V

Current requirements
- Logic 1 Source 0.25 ma at +2.4 V
- Logic 0 Sink 16 ma

Line termination
- Data and control 3.3 K ohm to +5 V
- Strobe 1.2 K ohm to +5 V

Serial Port

Serial Port Features

The serial port features are as follows:

Baud rates	300, 600, 1200, 2400, 4800, 9600, 19.2K
Bit patterns	8-bit, no parity; 8-bit odd; 8-bit even; 7-bit no parity; 7-bit odd; 7-bit even
Flow control	DTR and XON/XOFF

Table 13 Serial bit rates

It should be noted that the 7-bit, no parity is in fact an 8-bit format. The implementation of the hardware UART in the Intel 8051 family will not implement a true 7-bit, no parity format. If the host provides a true 7-bit, no parity format, it must be configured with two stop bits.

The M150 Printer has a 64-character high-speed buffer before the main system buffer. This high speed buffer allows the printer to operate at high serial data rates while printing. Because no data is evaluated in this buffer, the printer will have a delayed response to inquire requests and [CR]'s in one-line operation. This has a significant effect on one-line mode operation.

Serial Port Pin-out

Not connected	Input	Pin 1	DCD	Data carrier detect	Not used
Used in printer	Input	Pin 2	RX	Receive data	Commands/data to print
Output to host	Output	Pin 3	TX	Transmit data	Return data
Ready and/or flow control signal to host	Output	Pin 4	DTR	Data terminal ready	Printer ready to receive data (follows buffer)
		Pin 5	GND	Signal ground	
Disable printer control from host	Input	Pin 6	DSR	Data set ready	Not used in standard printer (configurable)
Ready and/or flow control signal to host	Output	Pin 7	RTS	Request to send	Printer ready to receive data (follows buffer)
Flow control from host	Input	Pin 8	CTS	Clear to send	Not used in standard printer (configurable)
*Strapable 12 V or DTR	Output	Pin 9	SSD	Secondary data	Not used in standard printer (provides power to peripheral)

Table 14 Serial port pin-out

Because both the host and the printer are DTE's (Data Terminal Equipment), they use the same serial port pin-outs. If the cable that is used to connect the host to the printer is a pin-to-pin interconnect, it will not work. For this reason, a null modem or turn-around cable must be used to interconnect the host and the printer.

Signal levels

The serial interface meets EIA RS232 requirements.

Logic 1 -15 V to -3 V: mark = off
Logic 0 +3 V to +15 V: space = on

Serial Port Protocol

The serial port supports two flow control standards, XON/XOFF and Ready/Busy (sometimes called DTR or hardware handshake.)

When Ready/Busy flow control is selected, the printer can be configured to use DTR, RTS, or both for flow control. If only DTR is selected for flow control, RTS will indicate that the printer has faulted. The following discussions will assume the DTR is being used for flow control.

The Ready/Busy protocol generally uses the DTR signal to indicate to the host computer that the printer is not ready to accept data. The host should stop sending data to the printer as soon as possible. Because the host may not notice the DTR signal until it has transmitted several bytes of data to the printer, the printer will continue to except up to 255[15] bytes of data after it indicates that it is not ready. The figure below illustrates how the Ready/Busy protocol works.

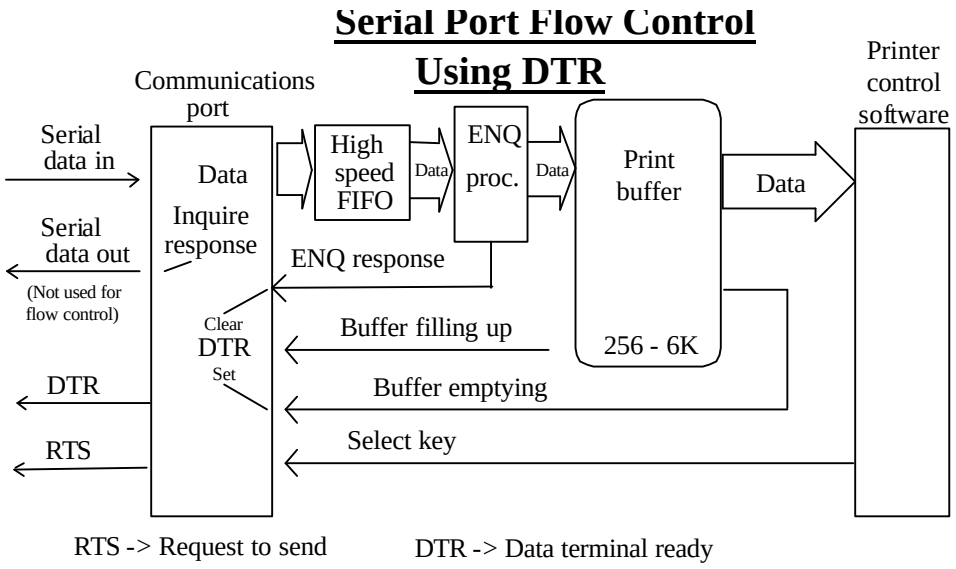


Figure 20 Serial port flow control using DTR

[15]The buffer always signals the buffer is full before it overflows. The size of the reserve depends on the buffer size selected. It is always at least 255 bytes.

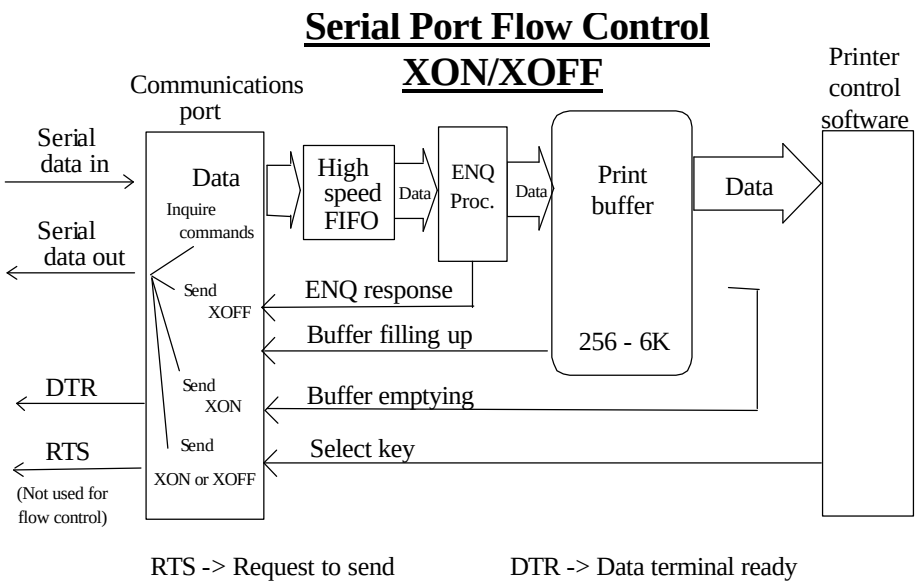


Figure 21 Serial port flow control XON/XOFF

Print Buffer Flow

The following flow chart illustrates the communication driver getting data from the serial port and placing the data in the buffer using Ready/Busy or XON/XOFF flow control.

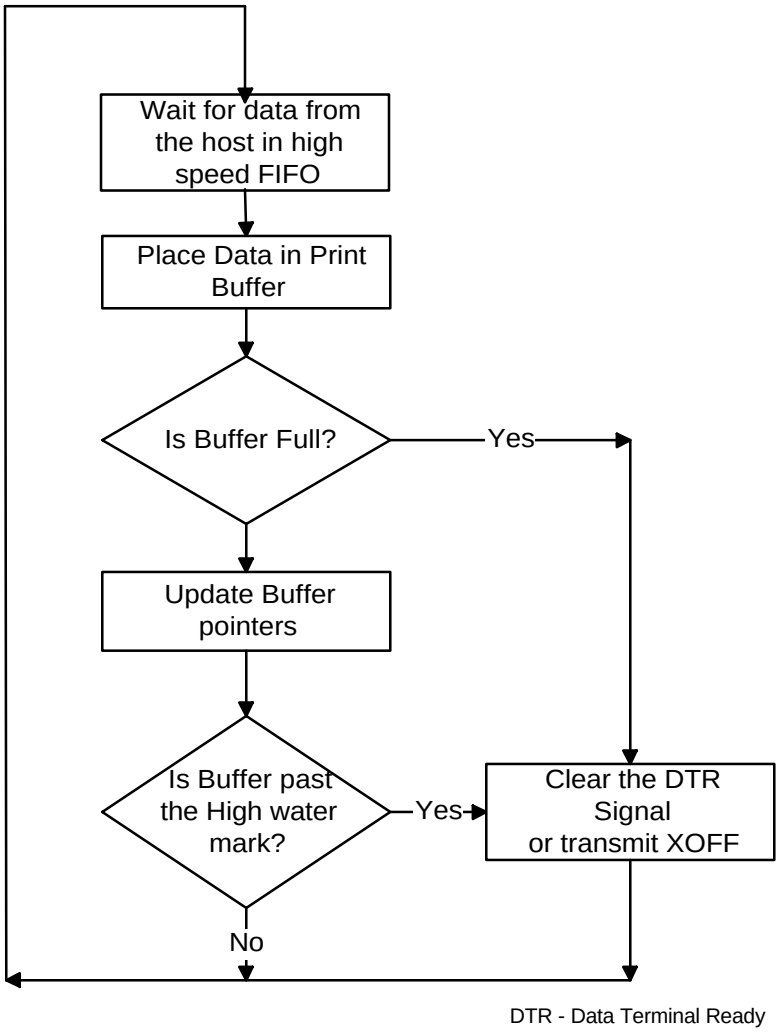

Wait for data from the host in high speed FIFO
Place Data in Print Buffer
Is Buffer Full?
Yes
Update Buffer pointers
Is Buffer past the High water mark?
Yes
Clear the DTR Signal or transmit XOFF
No
DTR - Data Terminal Ready

Figure 22 Serial buffer operation

At the top of the flow chart, the driver is waiting for data. When data is received from the host, the printer checks to see if it is an ENQ command. If the data is an ENQ, it is responded to and placed in the buffer. If not, the data is placed directly into the buffer. The buffer is then checked to see if it is full before the internal pointer is incremented. If it is not full, the pointer is incremented in preparation for the next data byte. The buffer is then checked to see if it is getting full by checking the amount of information in the buffer to see if it has passed a high watermark. If it has, the communication driver is notified, and it resets DTR to indicate to the host that no more data should be sent.

The following flow chart illustrates how the print controller takes information from the buffer and controls flow. At the top of the chart, the print control software asks for data. If there is no data in the buffer, a no data flag is returned. The print software must then wait for data. If there is data in the buffer, it is read and pointers are updated. The buffer is then checked to see how much information is left. If the buffer is below a low watermark (about 100 bytes left), the communication driver is notified, and DTR is reasserted.

If XON/XOFF flow control is being used, the flow is very similar to DTR flow except that DTR is not used and XON/XOFF control characters are transmitted back to the host on the serial link. XON/XOFF has an advantage over DTR in that only three wires are required to interconnect to a printer. The disadvantage is that a serial port receiver driver must be written for the host.

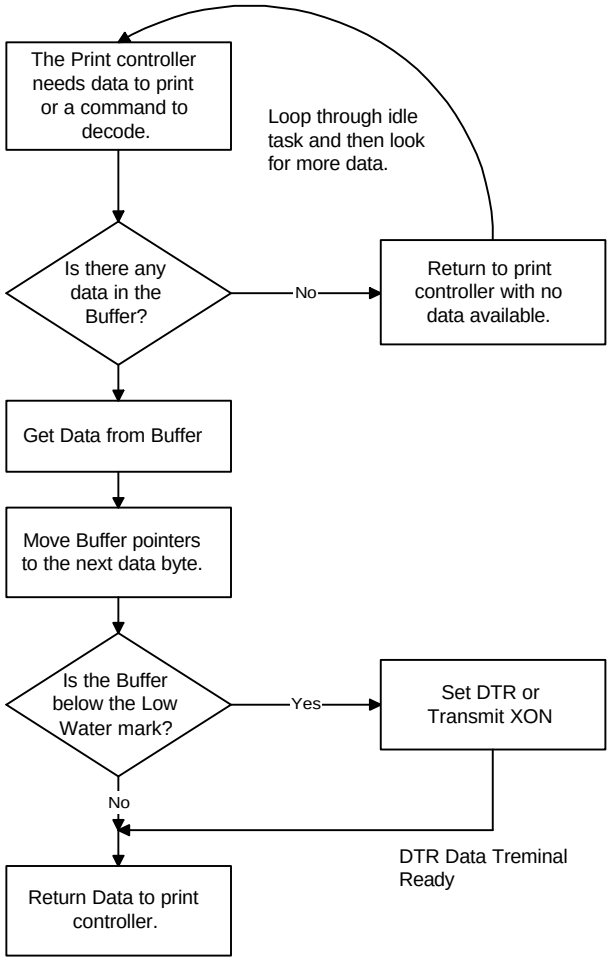

The Print controller needs data to print or a command to decode.
Loop through idle task and then look for more data.
Is there any data in the Buffer?
No
Return to print controller with no data available.
Get Data from Buffer
Move Buffer pointers to the next data byte.
Is the Buffer below the Low Water mark?
Yes
Set DTR or Transmit XON
No
DTR Data Treminal Ready
Return Data to print controller.

Figure 23 Print controller using data

The print controller is always looking for data when the printer is on-line and not printing. It continuously asks the buffer if it has any data. If there is no data in the buffer, it does housekeeping like keyboard scanning. If there is data, it processes it. The flow control is done when the data is taken from the buffer and the amount of data in the buffer is less than a prescribed amount. This low watermark is set based on the expected environment. The M150 Printer sets this at 200 characters. This gives the host application time to get more data to the printer before the printer uses up what it has.

When XON/XOFF protocol is implemented, it is possible for the host to miss an XON or an XOFF. To prevent this from causing a communication lockup, the printer will send an XOFF for every character received after the high watermark is reached.

Whenever the printer detects that the serial data link is inactive, it will send out an XON. This results in an XON being sent out about every two seconds.

When the printer is selected or deselected (with the SELECT key), an XON or XOFF will also be sent. This happens even if the internal data buffer is past the high watermark[16]. This is done so the host knows that the SELECT key has been pressed. If the buffer is full and an XON is sent, the next character sent by the host will cause an XOFF to be sent. The data that was sent by the host will not be lost unless the 255 character pad buffer is used up.

Printer Buffer Size

The M150 Printer has a configurable buffer size. It can be set from 256 bytes to 6144 bytes (This does not include the 64-character high-speed buffer). This allows an application to control how far ahead of the printer it can get before being asked to wait. The smaller the buffer is, the tighter the control. It is up to the application developer to select the optimal buffer size.

One-line Mode

The M150 Printer supports a one-line mode of operation. In this mode, the input buffer is set to 1024 bytes; however, the printer will go busy after every [CR] is received by the printer. In this mode, the printer will stay busy after the [CR] is received and remain busy until the previous information is printed. This mode is not recommended for serial operation unless the application looks for the line terminator handshake. There are several features that must be considered when using this mode.

1. The printer only looks at [CR]'s. [LF] will cause the printer to print but will not set busy.
2. If a [CR] character is received as part of another command, i.e., as part of graphical data, the printer will go busy after the [CR] is received and will go ready after the [CR] is processed.
3. By definition, one-line mode is slow. The printer will not allow the application to get ahead of it.
4. In serial mode, one-line mode is difficult to control. Because of the 64-character high speed FIFO, the printer will not go busy immediately after the [CR] is sent. It may take up to 25 milliseconds for the printer to process the [CR]. During this time, it is possible for the application to send up to 48 bytes of data to the printer. When the [CR] is found in the input stream, the busy status will be set. If the application continues to send information, the input buffer will be overrun as it only has 16 bytes left. In addition, the application will not truly be in one-line operation. The application must wait for at least 100 milliseconds after a [CR] before looking for busy status or trying to send more data.
5. In XON/XOFF mode, the printer is heavily burdened by the task of transmitting XOFF characters while printing and receiving data. The application should be written to look for the XOFF after every [CR]. The M150 Printer will lose data if too many characters follow the XOFF.

[16]If the host sends more information, it will be responded to by an XOFF.

Serial Port Inquire

The serial port inquire is more straight forward than parallel mode. The serial acknowledge (ACK) or not-acknowledge (NAK) responses follow a uniform format. The ACK or NAK is always followed by the command ID that requested it. This makes the design of the host application easier because the response can be identified and always follows the same format. Figure 24 Inquire flow is an example of a host/printer inquiry response exchange.

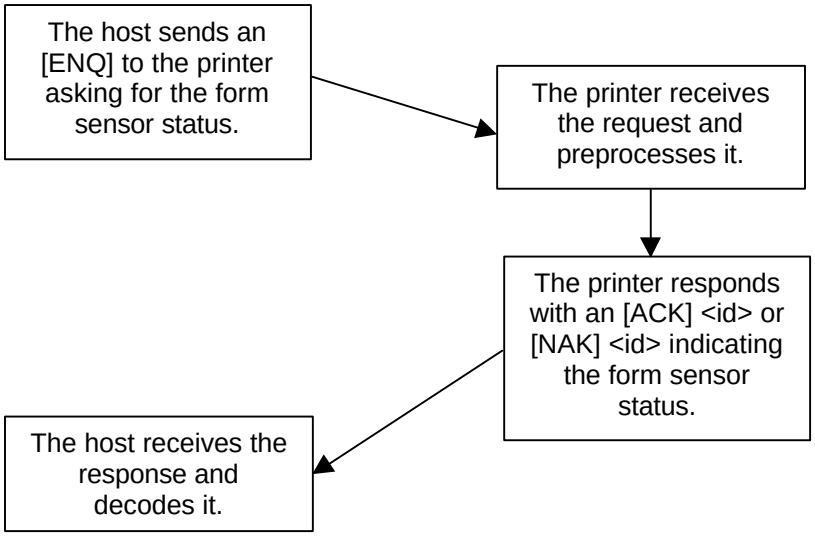

The host sends an [ENQ] to the printer asking for the form sensor status.
The printer receives the request and preprocesses it.
The printer responds with an [ACK] <id> or [NAK] <id> indicating the form sensor status.
The host receives the response and decodes it.

Figure 24 Inquire flow

The host sends an [ENQ]<id> (form sensor status) request to the printer. The printer responds with an [ACK]<id> indicating that the request was identified, and the status is true.

ENQ commands effect the printer's performance. The priority for communication in the printer is very high. ENQ commands take processing away from print tasks. It is possible to ask for so much status that the printer slows down.

In serial mode, it is very important that the response to an ENQ be received by the host before another command is issued. When an ENQ is received by the printer, it is buffered in a high speed process queue. When the printer has time, it empties the queue and processes the ENQ's. The printer responds to the command as soon as the second byte of the command is taken from the high-speed buffer. If the host is looking for a form to be inserted, it should not send status requests as fast as it can. The host will get a response to all of them, and if the host did not wait for a response to each, there would be unneeded responses.

In IEEE 1284 mode, inquiry responses are placed in an IEEE 1284 transmit queue. When the IEEE 1284 reverse channel is opened, the responses are returned to the host. It is important that after each request, the reverse channel be opened. Inquire responses will remain in the queue until read. If the [ENQ]<9> command is sent to the printer, the IEEE 1284 buffer will be cleared and only the response to the [ENQ]<9> will remain.

Remote Printer Reset

Reset in Serial Mode

It is possible to generate a printer reset in serial mode. The [ENQ]<10> command will request that the printer reset. (This is not a hardware reset). It will, however, completely initialize the hardware and software but will not recover from a loss of software control.

Note: If the printer mode was changed by the [ESC]y<2> or <3> command, a soft reset will not return to the power on default.

The command flow follows.

1. The [ENQ]<10> will be acknowledged, and then the software will reset.
2. The printer will be placed off-line.
3. The hardware and software will be reinitialized.
4. The printer will then go back on-line. Any information sent to the printer while it is off-line will be lost.

Reset in Parallel Mode

In parallel mode, driving the INIT signal on the parallel port for 100 milliseconds will generate a software reset. It will take about two seconds for the printer to recover from a reset. The [ENQ] <10> command will be rejected if parallel mode is active.

Power-cycle Recovery

There are times when the host needs to know if the printer was power cycled. An example would be changing the receipt tape. It is not necessary to turn the printer off to change the receipt. However, if the operator does, any information sent to the printer before the power cycle will be lost.

The Series 150 Printer has a flag that is set after a reset. The flag stays set until it is requested by the host; at which time, it is reset. The [ENQ]<11> command reads the flag. If the command returns power-cycled status, the power has been reset or power cycled since the last request and all unprinted information has been lost.

If the print operation is critical, it is a good idea to check the flag before and after all transactions. An alternate approach is to check the flag after every off-line to on-line transition.

Note: If the printer mode was changed by the [ESC]y<2> or <3> command, a power-cycle reset will return to the power on default.

Programmer’s Notes

When the serial port is being used, it is very important that the output lines from the printer not be shorted or back driven. If the signals are not to be used, they should be left open.

Pins 3, 4, and 7 are outputs from the printer. If any one of these signals is grounded or back driven, the other two outputs will be degraded.

If the printer is to be configured by the host with remote configuration, the best time to do this would be during system setup or system software update.

The printer should be power cycled after configuration to assure that the new configuration takes effect.

In serial mode, one-line mode should be avoided, particularly in XON/XOFF mode. The high speed FIFO input buffer makes one-line mode difficult to process.

If the knife module fails at any time, the configuration can be changed to deactivate the option and the printer will not ask it for its status. This will allow the printer to be used without the option until the printer can be repaired.

Chapter 11: Cash Drawer Interface

Interface Description

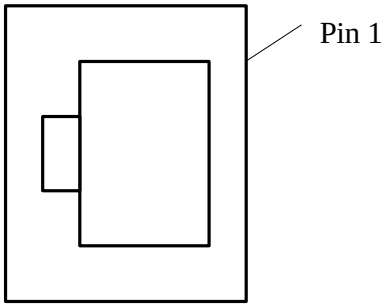
The M150 Printer supports dual cash drawers with status. The driver in the printer is capable of supplying 24 VDC at up to 1.5 amps for up to 250 milliseconds. The M150 Printer defines cash drawer closed as switch open. If the drawer is disconnected, it will be viewed by the printer as closed. Since the printer does not act on the cash drawer status, the application can interpret cash drawer status any way it wants.

Interface Connectors

There are two cash drawer connectors. One is configured as Cash Drawer 1, the other as Drawer 2. The pin-out is as follows:

Function	Drawer 1	Drawer 2
Drawer Drive +	Pin 4	Pin 4
Drawer Drive -	Pin 5	Pin 1
Status Signal	Pin 2	Pin 2
Status Ground	Pin 3	Pin 3
Frame Ground	Pin 6	Pin 6
No Connect	Pin 1	Pin 5

Table 15 Ithaca cash drawer connector



Note: Cash Drawer 2 can be factory configured to be the same as Drawer 1.

Function	Drawer 1	Drawer 2
Drawer Drive +	Pin 4	Pin 4
Drawer Drive -	Pin 2	Pin 5
No Connect	Pin 5	Pin 2
Status Signal	Pin 3	Pin 3
Status Ground	Pin 6	Pin 6
Frame Ground	Pin 1	Pin 1

Table 16 Epson/Axiohm cash drawer connector

Function	Drawer 1	Drawer 2
Drawer Drive -	Pin 2	Pin 2
Drawer Drive +	Pin 3	Pin 3
Status Signal	Pin 6	Pin 6
Frame Ground	Pin 1	Pin 1
No Connect	Pin 4	Pin 4
No Connect	Pin 5	Pin 5

Table 17 STAR cash drawer connector

Chapter 12: Printing Graphics

The Series 150 Printer has bit image graphic capabilities and a full PC-compatible character graphic character set. The bit image format is similar to that used on other PC printers. There are three modes of operation: single-density, half-speed double-density, and full-speed double-density.

Single-density is the fastest mode. It makes a single, unidirectional, 60 dpi print pass. The full-speed double-density makes two passes with a half-dot offset. This mode is half the speed of single-density print but will print at 120 dpi. Half-speed double-density is half the speed of full-speed double-density; however, the print quality is enhanced.

Character Graphics

Character graphics are created by joining individual characters together to produce a mosaic of characters that form a graphic image. The simplest method is to use the * (or any other character) to form an image. For example, IPI might be formed as follows.

```
***  ****  ***
 *    *   *   *
 *    ***     *
 *    *       *
***   *     ***
```

The extended character set of the printer supports line graphic characters that can be combined to form windows and other shapes. For the shapes to join from line to line, the line spacing must be set properly.

All characters are in a 9-dot-high character cell. The dots are 1/60 of an inch apart. Therefore, the line spacing should be 10/60 or 1/6 of an inch. The set fine line space command can be used to set this line spacing. If possible, the spacing should be reduced slightly to overlap the rows. This prevents any white space from appearing between the lines. The following example illustrates the use of extended graphic characters.

```
[ESC]U<1>          Select unidirectional print for better alignment.
[ESC]:             Select 12 cpi.
[ESC]3<34>         Set line spacing to 0.157 inch. (This is slightly smaller than 1/6 inch.)
  <201>            Send the line graphic characters to the printer.
<205><205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205>
<187>[CR][LF]
<186> PcOS PRINTERS  <186>[CR][LF]
<186>       <186>[CR][LF]
<186> MADE TO ORDER  <186>[CR][LF]
<186> BUILT TO LAST  <186>[CR][LF]
<200>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205><205><205><205><205><205>
<205><205><205><205>
<188>[CR][LF]      This finishes the line graphics.
[ESC]U<0>          Reenable bidirectional printing.
[ESC]0             Set standard 1/8-inch line spacing.
[SI]               Set 17 cpi.
[CR][LF]           Finish the form.
ST# 2000 OP# 00067 TE# 021 0035[CR][LF]
KLEENEX FAM D04 QTY 1  1.68 J[CR][LF]
RITZ   D01 QTY 1  2.50 D[CR][LF]
CHIPS  D01 QTY 1  1.50 D[CR][LF]
STORAGE BAG D04 QTY 1  1.50 J[CR][LF]
    SUB TOTAL 7.18[CR][LF]
    SALES TAX 1 .50[CR][LF]
       ------[CR][LF]
    TOTAL  7.68[CR][LF]
    CASH TEND 20.00[CR][LF]
    CHANGE DUE 12.23[CR][LF]
[CR][LF]
[ESC]a<1>
THANK YOU FOR SHOPPING WITH US[CR][LF]
[ESC]a<0>
[CR][LF]
{DATE:0}   {TIME:0}[CR][LF]
```

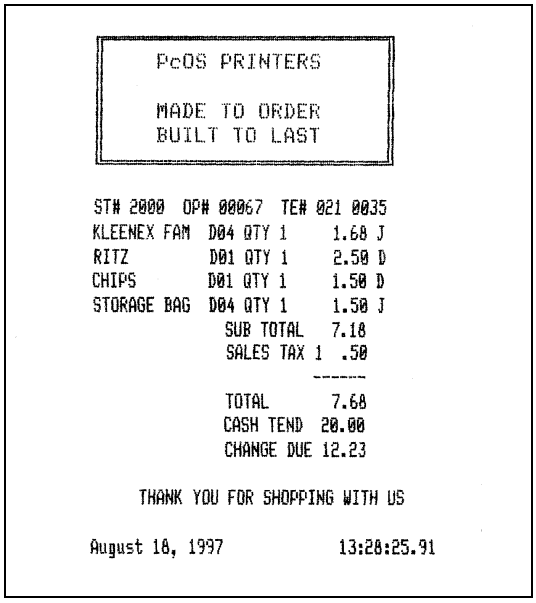

PcOS PRINTERS
MADE TO ORDER
BUILT TO LAST
ST# 2000 OP# 00067 TE# 021 0035
KLEENEX FAM D04 QTY 1 1.68 J
RITZ D01 QTY 1 2.50 D
CHIPS D01 QTY 1 1.50 D
STORAGE BAG D04 QTY 1 1.50 J
SUB TOTAL 7.18
SALES TAX 1 .50
TOTAL 7.68
CASH TEND 20.00
CHANGE DUE 12.23
THANK YOU FOR SHOPPING WITH US
August 18, 1997 13:28:25.91

Figure 25 Receipt with extended graphic characters

When printing line graphics, the data path to the printer must be 8-bits. Seven-bit serial protocols will not access the extended characters. The extended characters require that the form be reverse fed. This means that printing line graphics on the receipt may be less than acceptable.

APA Graphics

The printer is capable of APA[17] graphics. Generating a graphic image by hand is time consuming and tedious. It is possible to use a graphic package to create a graphic image. The following procedure will help with the setup.

1. Generate the graphic image in the program of your choice.
2. Make sure the paper size you choose will fit the printer station. If the paper size cannot be set, print a portion of the page.
3. Print the graphic to a file using a generic, IBM graphic 9-pin driver. The standard IBM resolutions are: 240 x 216 dpi, 120 x 72 dpi, and 60 x 72 dpi. The Series 150 Printer supports all three resolutions. For good resolution with reasonable speed, use 120 x 72 dpi.
4. Print the graphic image to a file.
5. Edit the resulting file to remove any unwanted form control, and insert the Series 150 form control.
6. Make the resulting file available to your application, so it will be sent to the printer when required.

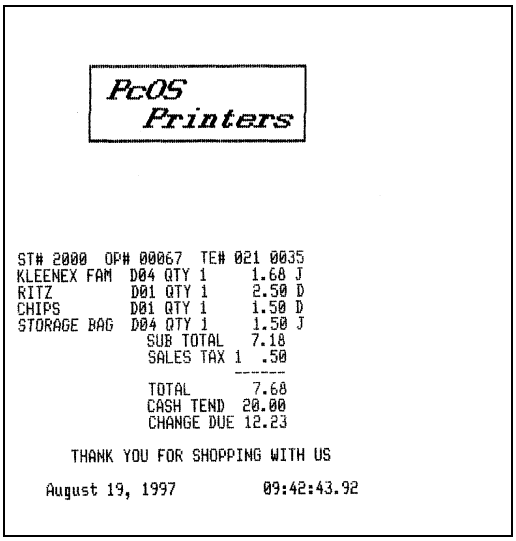

PcOS
Printers
ST# 2000 OP# 00067 TE# 021 0035
KLEENEX FAM D04 QTY 1 1.68 J
RITZ D01 QTY 1 2.50 D
CHIPS D01 QTY 1 1.50 D
STORAGE BAG D04 QTY 1 1.50 J
SUB TOTAL 7.18
SALES TAX 1 .50
TOTAL 7.68
CASH TEND 20.00
CHANGE DUE 12.23
THANK YOU FOR SHOPPING WITH US
August 19, 1997 09:42:43.92

Figure 26 Receipt with APA graphics

As with all graphics, the data path to the printer must be 8-bits; 7-bit protocols will not work.

The quad-density graphic resolution will give the best rendition of your graphic image; however, this mode is very slow and prints very dark. The printer is setup to provide the best performance in normal operation. For this reason, the quad-density graphics should be limited.

The APA graphic example above was done with double-density graphics. The graphic driver used made an approximation of the graphic image.

[17]APA - All Points Addressable

The first part of the graphic file is listed here in hex. This is a hex dump of the first 512 bytes of the graphic file printed on the above receipt.

```
0100 1B 43 00 0B 0D 0C 46 1B-48 1B 49 01 1B 54 1B 55 .C....F.H.I..T.U
0110 00 1B 55 00 1B 46 1B 49-01 1B 66 0D 34 00 8B 0D ..U..F.I..f.4...
0120 1B 55 01 1B 59 60 01 00-00 00 00 00 00 00 00 00 .U..Y`..........
0130 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0140 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0150 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0160 00 00 00 00 00 00 03 01-02 01 02 01 02 01 02 01 ................
0170 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
0180 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
0190 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01A0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01B0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01C0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01D0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01E0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
01F0 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
0200 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
0210 02 01 02 01 02 01 02 01-02 01 02 01 02 01 02 01 ................
0220 02 01 02 01 02 01 02 01-02 01 02 01 02 03 00 00 ................
0230 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0240 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0250 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0260 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0270 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
0280 00 00 00 00 00 00 00 1B-55 00 1B 4A 18 0D 1B 55 ........U..J...U
0290 01 1B 59 60 01 00 00 00-00 00 00 00 00 00 00 00 ..Y`............
02A0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
02B0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
02C0 00 00 00 00 00 00 00 00-00 00 00 00 00 00 00 00 ................
02D0 00 00 00 00 FF FF 00 00-00 00 00 00 00 00 00 00 ................
02E0 00 00 00 00 00 00 00 00-00 00 00 00 02 01 02 01 ................
02F0 02 00 02 00 02 00 02 01-02 01 00 00 00 00 00 00 ................
```

Appendix A
Language Tables

Code Page	Country Code/ Language Set	Decimal <n_1> <n_2>	Hex <n_1> <n_2>	ASCII <n_1> <n_2> <n_3>	Epson ID
64	USA (slashed 0)	0,64	0H,040H	0,0,6,4	NA
65	USA (unslashed 0)	0,65	0H,041H	0,0,6,5	NA
66	British	0,66	0H,042H	0,0,6,6	3
67	German	0,67	0H,043H	0,0,6,7	2
68	French	0,68	0H,044H	0,0,6,8	NA
69	Swedish I	0,69	0H,045H	0,0,6,9	5
70	Danish I	0,70	0H,046H	0,0,7,0	NA
71	Norwegian	0,71	0H,047H	0,0,7,1	NA
72	Dutch	0,72	0H,048H	0,0,7,2	14
73	Italian	0,73	0H,049H	0,0,7,3	NA
74	French Canadian	0,74	0H,04AH	0,0,7,4	13
75	Spanish I	0,75	0H,04BH	0,0,7,5	NA
76	Swedish II	0,76	0H,04CH	0,0,7,6	15
77	Swedish III	0,77	0H,04DH	0,0,7,7	16
78	Swedish IV	0,78	0H,04EH	0,0,7,8	17
79	Turkish	0,79	0H,04FH	0,0,7,9	18
80	Swiss I	0,80	0H,050H	0,0,8,0	19
81	Swiss II	0,81	0H,051H	0,0,8,1	20
90	Publisher	0,90	0H,05Ah	0,0,9,0	64
437	USA	1,181	1H,0B5H	0,4,3,7	0
774	Baltic	3,6	3H,006H	0,7,7,4	74
850	Multilingual	3,82	3H,052H	0,8,5,0	26
852	East European Latin II	3,84	3H,054H	0,8,5,2	46
855	Cyrillic I	3,87	3H,057H	0,8,5,5	44
857	Turkey	3,89	3H,059H	0,8,5,7	57
860	Portugal	3,92	3H,05CH	0,8,6,0	28
861	Icelandic	3,93	3H,05DH	0,8,6,1	73
862	Hebrew NC	3,94	3H,05EH	0,8,6,2	60
863	Canada French	3,95	3H,05FH	0,8,6,3	43
865	Norway	3,97	3H,061H	0,8,6,5	27
866	Cyrillic II	3,98	3H,062H	0,8,6,6	45
869	Greek_869	3,101	3H,065H	0,8,6,9	47

Code Page	Country Code/ Language Set	Decimal <n_1> <n_2>	Hex <n_1> <n_2>	ASCII <n_1> <n_2> <n_3>	Epson ID
895	Kamenicky (MJK)	3,127	3H,07FH	0,8,9,5	55
1008	Greek 437	3,240	3H,0F0H	1,0,0,8	38
1009	Greek 928	3,241	3H,0F1H	1,0,0,9	39
1011	Greek 437 CYPRUS	3,243	3H,0F3H	1,0,1,1	41
1012	Turkey	3,244	3H,0F4H	1,0,1,2	29
1014	Polska Mazovia	3,246	3H,0F6H	1,0,1,4	22
1015	ISO Latin 2	3,247	3H,0F7H	1,0,1,5	23
1016	Serbo Croatic I	3,248	3H,0F8H	1,0,1,6	24
1017	Serbo Croatic II	3,249	3H,0F9H	1,0,1,7	25
1018	ECMA-94	3,250	3H,0FAH	1,0,1,8	42
1019	Windows East Europe	3,251	3H,0FBH	1,0,1,9	49
1020	Windows Greek	3,252	3H,0FCH	1,0,2,1	50
1021	Latin 5 Windows Turkey	3,253	3H,0FDH	1,0,2,2	51
1022	Windows Cyrillic	3,254	3H,0FEH	1,0,2,4	52
1024	Hungarian CWI	4,0	4H,000H	1,0,2,5	54
1026	ISO Latin 4	4,2	4H,002H	1,0,2,6	56
1027	Ukrainian	4,3	4H,003H	1,0,2,7	66
1028	Roman-8	4,4	4H,004H	1,0,2,8	58
1029	ISO Latin 6	4,5	4H,005H	1,0,2,9	67
1031	Hebrew OC	4,7	4H,007H	1,0,3,0	61
1032	Windows Hebrew	4,8	4H.008H	1,0,3,2	62
1033	KBL-Lithuanian	4,9	4H,009H	1,0,3,3	63
1034	Windows Baltic	4,10	4H,00AH	1,0,3,4	68
1035	Cyrillic-Latvian	4,11	4H,00BH	1,0,3,5	69
1072	Bulgarian	4,48	4H,030H	1,0,7,2	72
NA	French				1
NA	Danish I				4
NA	Italian				6
NA	Spanish I				7
NA	Japanese				8
NA	Norwegian				9
NA	Danish II				10
NA	Spanish II				11
NA	Latin American				12

Table 18 Code page definitions

Note: There is a demonstration script distributed with the CFG150 program that will print a complete character chart for IBM or EPOS modes. See the CFG150 distribution disk.

Appendix B
ASCII Code Chart

HEX	Decimal	ASCII	HEX	Decimal	ASCII	HEX	Decimal	ASCII	HEX	Decimal	ASCII
00	0	NULL	20	32	(SP)	40	64	@	60	96	`
01	1	SOH	21	33	!	41	65	A	61	97	A
02	2	STX	22	34	"	42	66	B	62	98	B
03	3	ETX	23	35	#	43	67	C	63	99	C
04	4	EOT	24	36	$	44	68	D	64	100	d
05	5	ENQ	25	37	%	45	69	E	65	101	e
06	6	ACK	26	38	&	46	70	F	66	102	f
07	7	BEL	27	39	'	47	71	G	67	103	g
08	8	BS	28	40	(	48	72	H	68	104	h
09	9	HT	29	41	)	49	73	I	69	105	i
0A	10	LF	2A	42	*	4A	74	J	6A	106	j
0B	11	VT	2B	43	+	4B	75	K	6B	107	k
0C	12	FF	2C	44	,	4C	76	L	6C	108	l
0D	13	CR	2D	45	-	4D	77	M	6D	109	m
0E	14	SO	2E	46	.	4E	78	N	6E	110	n
0F	15	SI	2F	47	/	4F	79	O	6F	111	o
10	16	DEL	30	48	0	50	80	P	70	112	p
11	17	DC1	31	49	1	51	81	Q	71	113	q
12	18	DC2	32	50	2	52	82	R	72	114	r
13	19	DC3	33	51	3	53	83	S	73	115	s
14	20	DC4	34	52	4	54	84	T	74	116	t
15	21	NAK	35	53	5	55	85	U	75	117	u
16	22	SYN	36	54	6	56	86	V	76	118	v
17	23	ETB	37	55	7	57	87	W	77	119	w
18	24	CAN	38	56	8	58	88	X	78	120	x
19	25	EM	39	57	9	59	89	Y	79	121	y
1A	26	SUB	3A	58	:	5A	90	Z	7A	122	z
1B	27	ESC	3B	59	;	5B	91	[	7B	123	{
1C	28	FS	3C	60	<	5C	92	\	7C	124	|
1D	29	GS	3D	61	=	5D	93	]	7D	125	}
1E	30	RS	3E	62	>	5E	94	^	7E	126	~
1F	31	US	3F	63	?	5F	95	_	7F	127	(sp)

Table 19 ASCII chart

Appendix C
Ordering Cables

General Information

To order cables, use the following order numbers:

10-2020	9-pin female to 9-pin female serial interconnect
10-2021	9-pin female to 25-pin female serial interconnect
10-2022	9-pin female to 25-pin male serial interconnect
253-9800007	25-pin male to 25-pin male parallel interconnect

All of the above may be ordered by calling (607) 257-8901 and asking for the Sales Department or faxing an order to (607) 257-8922.

You may also order by mail. The address is:

Ithaca Peripherals
20 Bomax Drive
Ithaca, New York 14850

Index

—[—

[CAN] Clear print buffer....54
[CR] New line....15
[DC2] Set 10 cpi....30
[DC4] End one-line double-wide....32
[ENQ] <1> Inquire Cash Drawer 1 status....60
[ENQ] <10> Request printer reset....62
[ENQ] <11> Request printer power-cycle status....62
[ENQ] <2> Inquire Cash Drawer 2 status....60
[ENQ] <4> Inquire receipt-paper out status....60
[ENQ] <6> Inquire form position sensor status....61
[ENQ] <7> Inquire form-clamp status....61
[ENQ] <9> Send response....61
[ENQ] <n> Inquire printer status....60
[ESC] - <0> End underline....34
[ESC] - <1> Begin underline....34
[ESC] ! <n> Select international character set....24
[ESC] # <0> Begin High Speed Draft Mode....22
[ESC] $ Copy ROM Character Set to RAM Character Set....27
[ESC] % G Begin italics....36
[ESC] % H End italics....37
[ESC] * <m> <n>1 <n>2 Print graphics in mode <n>....44
[ESC] \: Set 12 cpi....30
[ESC] ? <m><n> Reassign graphics mode....44
[ESC] [@ ... Double-high, double-wide, and italic 33
[ESC] [P <n> Set cpi....31
[ESC] [T <n_h> <n_l> Select Character Code Page..26
[ESC] [DC1] Open forms clamp....51
[ESC] [DC3] Close forms clamp....51
[ESC] [DC4] Select validation mode....51
[ESC] [EM] B 0 Bar code height....48
[ESC] [EM] C <0> Validation clamp delay....52
[ESC] [EM] J <n> Bar code justification....48
[ESC] [EM] V <n> Set validation delay....52
[ESC] [SI] Set 24 cpi....30
[ESC]] Reverse line feed....21
[ESC] ^ <n> Print control character....27
[ESC] _ <0> End overscore....34
[ESC] _ <1> Begin overscore....34
[ESC] ~ <n> Extended diagnostics....66
[ESC] < <n> Pass through....56
[ESC] < <n> Print suppress....56
[ESC] = <c1><c2><start code><data> Character download....27
[ESC] > <0> Custom character set OFF....28
[ESC] > <1> Custom character set ON....27
[ESC] 0 Set line space 27/216 inch....18
[ESC] 1 Set line spacing 7/72 inch....19
[ESC] 2 Enable variable line spacing....19
[ESC] 3 <n> Set line spacing n/216 inch....18
[ESC] 4 Set top of form....20
[ESC] 5 <0> End auto line feed....21
[ESC] 5 <1> Begin auto line feed....21
[ESC] 8 Disable PE sensor....49
[ESC] 9 Enable PE sensor....49
[ESC] a <n> Set justification....17
[ESC] A <n> Set variable line spacing n/72 inch....19
[ESC] b <n> ... Print bar code....46
[ESC] B <n>1 <n>2 Set vertical tab stops....20
[ESC] C Set form length....21
[ESC] C [NUL] Set form length....21
[ESC] d <n> Enable variable line spacing....19
[ESC] D <n>1 <n>2 Set horizontal tab stops....16
[ESC] E Begin emphasized print....35
[ESC] F End emphasized print....35
[ESC] G Begin enhanced print....35
[ESC] H End enhanced print....35
[ESC] I <1> Set Utility Print Mode....22
[ESC] J <n> Fine line feed....18
[ESC] K <n>1 <n>2 Print single-density graphics...43
[ESC] L <n>1 <n>2 Print double-density graphics..43
[ESC] P <0> Reset 90° rotated font....23
[ESC] P <1> Set 90° rotated font....23
[ESC] P <2> Set 270° rotated font....23
[ESC] q <n> Query marker....55
[ESC] r <0> End rotated print....41
[ESC] r <1> Rotate 90 degrees....39
[ESC] r <2> Rotate 180 degrees....40
[ESC] r <3> Rotate 270 degrees....40
[ESC] r <5> Rotate 90 degrees....39
[ESC] r <7> Rotate 270 degrees....40
[ESC] R Reset horizontal tab stops....17, 20
[ESC] s <n> Set rotated print line length....41
[ESC] S<0> Select superscript....36
[ESC] S<1> Select subscript....36
[ESC] T End superscript or subscript....36
[ESC] U <0> Begin bidirectional print....45
[ESC] U <1> Begin unidirectional print....44, 45
[ESC] u <n>1 <m>1 Set rotated print line spacing..42
[ESC] V <n> Set intercharacter spacing....31
[ESC] W <n> Double-wide and double-high....33
[ESC] w <n> Enable dynamic response....57
[ESC] x <n> Open cash drawer....54
[ESC] X <n1> <n2> Set left/right margin....53
[ESC] y <n> Feature control....56
[ESC] Y <n>1 <n>2 Print double-density graphics .43
[ESC] Z <n>1 <n>2 Print quad-density graphics....43
[ESC]v Activate cutter....50
[FF] Form feed....20
[HT] Horizontal tab....16
[LF] Line feed....15
[SI] Set 17 cpi....30
[SO] One-line double-wide....32
[VT] Vertical tab....20

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